Reasonable Available Control Technology Review for Chevron Salt Lake Marketing Terminal

March 30, 2021

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1. Introduction

1.1 Purpose

The Utah Department of Environmental Quality's (UDEQ) Division of Air Quality (DAQ) has requested in a letter received November 5, 2020, that the Chevron Salt Lake Marketing Terminal (SLMT) submit a Reasonably Available Control Technology (RACT) analysis for all the nitrogen oxide (NOx) and volatile organic compound (VOC) emission units at the terminal no later than 31 March 2021. A copy of the UDEQ request letter is enclosed in Appendix A for reference.

The UDEQ letter requests the following for each applicable source:

- A list of each NO_x and VOCs emission units at the facility. All emission units with a potential to emit either NO_x or VOCs must be evaluated.
- A physical description of each emission unit and its operating characteristics, including but not limited to: the size or capacity of each affected emission unit; types of fuel combusted; and the types and quantities of materials processed or produced in each affected emission unit.
- Estimates of the potential and actual NO_x and VOC emissions from each affected source and associated supporting documentation.
- The proposed alternative NO_x RACT requirement(s) or NO_x RACT emissions limitation(s), and/or the proposed VOC requirement(s) or VOC RACT emissions limitation(s) (as applicable).
- Supporting documentation for the technical and economic considerations for each affected emission unit.
- A schedule for completing implementation of the RACT requirement or RACT emissions limitation, including start and completion of project and schedule for initial compliance testing.
- Proposed testing, monitoring, recordkeeping, and reporting procedures to demonstrate compliance with the proposed RACT requirement(s) and/or limitation(s).
- Additional information requested by DAQ necessary for the evaluation of the RACT analyses.

Permitted SLMT emissions include VOC and Hazardous Air Pollutant (HAP) emissions; no NOx emission sources are permitted. Therefore, RACT requirements or emission limits will only address VOC emissions from the facility.

1.2 SLMT Process and Emission Unit Descriptions

The SLMT is a bulk gasoline terminal, which receives product by pipeline from the Salt Lake Refinery (SLR) as well as ethanol and additives from outside vendors by truck (unloaded at the specialty rack) and railcar (cargo tank rack). Products are dispensed through the primary truck loading rack to cargo tank trucks where the product is delivered to gasoline dispensing facilities (gas stations). Twenty-five (25) storage tanks at the site store gasoline, ethanol (oxygenate), Transmix, diesel fuel, water, additives, hydraulic fluid, motor oil, or jet fuel. The facility has two permitted loading rack operations. The primary loading rack has four product delivery bays, two vapor recovery units (VRUs) controlling emissions from the loading rack operations. Ethanol and other additives are blended in line with refined products at the truck loading rack. A specialty rack loads small quantities of Transmix and slop and is not connected to a VRU.

The facility' s operating schedule is 24 hours per day, 7 days per week, 365 days a year. Emissions of concern at the facility are VOCs and Hazardous Air Pollutants (HAP) emitted primarily from the truck loading, storage tanks and piping components. Emissions are limited at the terminal to 33.6 tons per rolling

12-month period of VOCs and 4.19 tons of HAPs. Facility throughput is also limited to the following barrels (bbl) per 12-month period:

i. 11,905,000 bbl gasoline
ii. 928,000 bbl oxygenate
iii. 10,688 bbl additive
iv. 11,905,000 distillates

Vapors displaced during product loading at the SLMT are recovered using vapor return hoses that connect the cargo tank trucks to an activated carbon vapor recovery system collectively referred to as the VRU. The VRU consists of two independent carbon adsorption systems, one of which serves as the primary control device, and the second serves as a backup in time where the primary unit is unavailable. Each of these two systems has two vessels (beds) containing carbon filtration media. Per design, one carbon bed controls displaced vapors while the other carbon bed regenerates (i.e. valves located at the entry and exit points for each VRU system alternate the carbon beds between controlling the vapor flow and regeneration). Abated vapors are emitted through the exhaust of the active VRU system after being stripped of the majority of VOCs. A dedicated VOC continuous parametric monitoring system (CPMS) measures the hydrocarbon concentration at the VRU exhaust and documents compliance with regulatory limits.

1.2.2 Emission Units Evaluated

Table 1 presents the primary sources of VOC and HAP emissions at the site that are not tanks as well as associated controls. An inventory of the storage tanks, type of tank, capacity and stored product is provided in Table 2 below.

Table 1. Non-Tank Emission Sources

Emission Source	Description	Control
Loading Rack	Four bay, bottom loading rack for loading of gasoline, oxygenate, additives and distillate to tanks/cargo tanks	Two John Zinc VRUs - two carbon bed vapor recovery units with 128,000 and 180,000 gallon fill capacities
Specialty Rack	Four bay, bottom loading rack for loading of lube oil, hydraulic oils, Techron, Transmix and slop	N/A
Fugitive Emissions	Piping (connectors and flanges), valves, pumps and compressors	N/A

Table 2. SLMT Storage Tanks

Tank Number	Tank Type	Year of Construction	Nominal Capacity (bbl)	Product
1	VFRT	1950	1000	Motor Oil
2	VFRT	1950	1000	Motor Oil
3	VFRT	1950	1000	Motor Oil
4	VFRT	1950	1000	Motor Oil
15	IFRT	1950	1000	Transmix
16	VFRT	1950	1000	Motor Oil
19	VFRT	1951	500	Additive (Generic)
21	VFRT	1950	1000	Hydraulic Fluid
22	VFRT	1950	1000	Hydraulic Fluid
23	VFRT	1950	1000	Hydraulic Fluid
24	VFRT	1950	500	Hydraulic Fluid
26	VFRT	1984	475	Additive (Techron)
27	VFRT	1984	475	Additive (Techron)
28	IFRT	1984	2000	Gasoline
29	Horizontal	1988	150	Spare Additive Storage (as needed)
31	IFRT	1992	20000	Gasoline
32	IFRT	1992	10000	Gasoline
33	IFRT	1992	10000	ULSD NO 2
34	IFRT	1992	10000	Gasoline
35	VFRT	1992	5000	ULSD
36	VFRT	1992	20000	ULSD
37	IFRT	1992	10000	Ethanol (Oxygenate)
38	IFRT	1992	10000	Ethanol (Oxygenate)
39	VFRT	1992	5000	Jet
40	Horizontal	2015	40	Red-Dye Additive

1.3 Facility Emissions

As noted in Section 1.2, the terminal is currently limited to a facility-wide limit of 33.6 tons per 12-month period. The terminal currently operates less than 50% of the permitted limit. Within the last 5 years, the highest annual VOC emissions were 14.98 tons in 2016. A summary of calendar year 2016 emissions is presented in Table 3 below. A detailed breakout of calendar year 2016 emissions is provided in Appendix A.

Table 3. SLMT 2016 Emission Summary

Pollutant	Truck Racks	Tanks	Fugitive	Total
	Tons			
VOC	8.62	5.61	0.75	14.98
Total HAPs	0.20	0.44	0.11	0.74

2. Proposed RACT VOC Requirements or VOC RACT Emissions Limitation

2.1 Introduction

DAQ anticipates that the Environmental Protection Agency (EPA) will reclassify the Northern Wasatch Front Ozone Nonattainment Area to moderate classification in early 2022. The Clean Air Act (CAA) requires areas re-classified from marginal to moderate to implement RACT level controls for all VOC sources that are subject to a Control Techniques Guidelines (CTG) document and for all other "major sources"[1] of VOC emissions. A CTG is a guideline document issued by the EPA that establishes a "presumptive norm" for the level of emission control that represents RACT for a specific VOC source category. A CTG, *Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals* (EPA450/2-77-026) was published October 1977, therefore RACT must be evaluated for loading terminals in the proposed nonattainment area.

While the methodology described in the Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals (EPA450/2-77-026) CTG represents the presumptive norm or RACT to have been applied to gasoline loading terminals in 1977, RACT can evolve over time as new technology becomes available or the cost of existing technology decreases. More recent control requirements for gasoline loading terminals were issued under the New Source Performance Standard (NSPS) for Bulk Gasoline Terminals (aka NSPS XX), promulgated in 1983 and amended in 2003 as well as the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations) (aka MACT Subpart R), promulgated in 1994 and amended multiple times, with the most recent in 2006. In addition to the federal regulations for Gasoline Terminals, NSPS for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) (aka NSPS Kb), promulgated in 1987 and amended in 2021, also applies to the storage tanks at the terminal.

NESHAP must reflect the maximum reductions of HAP achievable (after considering cost, energy requirements, and non-air health and environmental impacts) and are commonly referred to as maximum achievable control technology (MACT) standards. The SLMT is currently subject to and in compliance with MACT Subpart R.

The primary purpose of the NSPS is to attain and maintain ambient air quality by ensuring that the best demonstrated emission control technologies are installed as industrial infrastructure is modernized. The SLMT is currently subject to and in compliance with NSPS XX and Kb.

While NSPS XX, Kb and MACT Subpart R should represent the best demonstrated emission control technologies for a gasoline terminal, it is possible that additional controls could be reasonably available that are not currently in place. The following section outlines the RACT analysis process and the proposed RACT for operations at the terminal.

2.2 Top-Down RACT Review

A RACT analysis requires implementation of the lowest emission limitation that an emission source is capable of meeting by the application of a control technology that is reasonably available, considering technological and economic feasibility. A RACT analysis must include the latest information when evaluating control technologies. Control technologies evaluated for a RACT analysis can range from work practices to add-on controls. As part of the RACT analysis, current control technologies already in use for VOC sources can be taken into consideration. To conduct a RACT analysis, a top-down analysis is used to rank all control technologies. A top-down RACT analysis steps includes the following five steps:

[1] CAA §182(b)(2)

Step 1. Identify All Reasonably Available Control Technologies
Step 2. Eliminate Technically Infeasible Control Technologies
Step 3. Rank Remaining Control Technologies Based on Capture and Control Efficiencies
Step 4. Evaluate Remaining Control Technologies on Economic, Energy, and Environmental Feasibility
Step 5. Select RACT

The following presents the detailed RACT analysis for the emission units identified in Section 1.2.

2.2.1 Loading Racks

2.2.1.1 Reasonable Control Technologies

When cargo tank trucks are filled with gasoline, VOCs are displaced to the atmosphere. To minimize the vapors released to the atmosphere, the vapors can be controlled by one or more of the following methods as described below:

1) Employ top-submerged or bottom loading of cargo tank trucks
2) Minimize spills and clean up any spills expeditiously
3) Load only to vapor-tight cargo tank trucks compatible with the terminal's vapor collection system (VCS)
4) Design a VCS to collect total VOCs displaced from cargo tank truck loading to route vapors collected from loading operations to a vapor processing system (VPS) including:
    a. refrigeration based control system;
    b. vapor recovery unit (VRU) with carbon adsorption; or
    c. thermal oxidation system with an open or enclosed flame (aka vapor combustion unit [VCU])

The RBLC database was searched for final VOC RACT/BACT/LAER determinations for Process Type 42.000, Organic Liquid Storage & Marketing (Petroleum, Gasoline, Vol). Results from the RBLC database returned four (4) facilities that evaluated controls for VOCs on loading racks (listed under Process Type 42.002). Three facilities were reviewed under state BACT, listed VCS and VRU or VCU controls, submerged loading, work practice standards to minimize spills, clean up spills expeditiously, unload only to vapor-tight cargo tank trucks and maintain hatch and seals, limit diesel loading to 0.014 lb VOC/1000 gallons and limit gasoline loading to 35 mg/liter and 0.159 lb/1000 gallons. The fourth facility was reviewed under LAER and listed VCS and VRU control with 95% control efficiency and 0.42 lb/hour emission rate. The process notes indicate controls reduce VOC emissions to less than 1 mg/liter (0.01 lb/1000 gal), but do not specifically list that as a limit.

2.2.1.2 Eliminate Technically Infeasible Control Technologies

All of these controls and work practices are technically feasible for the SLMT. However, refrigeration based emission reduction systems including compression-refrigeration-absorption (CRA) systems and straight refrigeration systems (RF) are unable to reduce VOC emissions to meet the control requirements set forth in MACT subpart R; therefore, it is eliminated as a technically feasible control for that reason.

2.2.1.3 Rank Remaining Control Technologies Based on Capture and Control Efficiencies

As indicated in 2.2.1.1, the control technologies listed can be employed individually or together. Both NSPS XX and MACT Subpart R, require a VCS in place with a VPS to reduce VOC emissions from loading racks at bulk gasoline terminals which deliver liquid product into gasoline tank trucks. Both regulations require gasoline loading to a certified vapor-tight cargo tank truck that is compatible with the terminal's VCS. VRUs have been shown to reduce VOC emissions by over 95 percent[2]. When operating properly, VRUs generally approach 100 percent efficiency. VCUs can be designed to meet 99.9% control efficiencies; however, EPA notes that control efficiency achieved in the field is likely to be lower and assume combustion devices can

[2] U.S. Environmental Protection Agency. Lessons Learned from Natural Gas STAR Partners. Installing Vapor Recovery Units on Storage Tanks. Natural Gas STAR Program. October 2006. (Quoted in reference #3 below)

can control, on average, emissions by 98 percent or more in practice when properly operated.[3]

2.2.1.4 Evaluate Remaining Control Technologies on Economic, Energy, and Environmental Feasibility

VRUs result in cost savings associated with the recycled, recovered and reused gasoline and other hydrocarbon vapor, rather than the loss and destruction of the gasoline and vapor by combustion. Combustion and partial combustion of organic pollutants also creates secondary pollutants including nitrogen oxides, carbon monoxide, sulfur oxides, carbon dioxide and smoke/particulates.

Primary Loading Rack: SLMT is already employing all of the technically feasible control technologies identified in section 2.2.1.1 except VCU at the primary loading rack. Since VCU and VRU have similar control efficiencies and VRU has more favorable environmental impacts, a further analysis of VCU controls is not necessary for the primary loading rack. Use of the VRU controls on the primary loading rack represents a “top” level of control.

Specialty Loading Rack: A majority of products loaded from the specialty loading racks are finished lubricants, lubricant additives and base oils, which are very low volatility products and generate a small fraction of the total emissions from the facility. SLMT is employing bottom filling of tanks and the work practice standards of minimizing spills and clean up any spills expeditiously. Throughputs to this rack are low and current operations indicate VOC emissions from loading of Transmix and slop to cargo tank trucks are less than 0.2 tons annually. Operation is currently a little less than 50% of permitted emissions. Translating current operation to permitted operation levels, Transmix emissions would be approximately 0.5 tons annually.

To estimate the potential cost-effectiveness of installing a VRU system to control this loading rack emissions, the Control Techniques Guidelines for the Oil and Natural Gas Industry report was reviewed[4]. It contained several examples of potential controls and evaluated each one’s cost effectiveness relative to various uncontrolled emissions rates. The lowest uncontrolled emissions rate evaluated was 2 tons/yr, much higher than the emissions from the specialty loading rack. For various control systems used to abate a 2 tons/yr source, the best cost-effectiveness in the report was over $13,000/ton in 2012 dollars. For example. The report estimated in 2012 dollars that installation of a new VRU including retrofit of a storage vessel (we will conservatively assume retrofit of the specialty loading rack would be similar for this exercise) would be a total of $171,000. Annual costs including maintenance and capital recovery in 2012 dollars would be ~$28,000. The report calculated the cost per ton of VOC reduced for a system with uncontrolled emissions of 2 tons per year (tpy) would be ~$14,000. This value would be higher for a source with only 0.5 tpy expected emissions.

2.2.1.5 Select RACT

Results of the top-down RACT analysis indicate that work practice standards, paired with loading design and VCS and VRU or VCU is considered the highest level of possible control for loading racks. VRUs enable product recovery while VCUs create organic pollutants and secondary pollutants including nitrogen oxides, carbon monoxide, sulfur oxides, carbon dioxide and smoke/particulates in the combustion process, making the VRU a better chose for the loading rack application. A review of the RBLC indicates emission rates of 0.014 lbs VOC/1000 gallon diesel loaded has been deemed state BACT as well as 35 mg/liter or the lower rate of 0.159 lbs VOC/gallon gasoline loaded is state BACT. One facility reviewed under the more stringent LAER program listed 95% VOC control efficiency and 0.42 lb/hour VOC emission rate. Process notes indicate the system is able to achieve 1 mg/liter; however, it is not a limit.

[3] U.S. Environmental Protection Agency. Control Techniques Guidelines for the Oil and Natural Gas Industry. Office of Air and Radiation. EPA-453/B-16-001. October 2016.
[4] Pages 4-1 through 4-16 of CTG are provided in Appendix C to support the cost effectiveness of VRU application for the specialty rack.

Chevron proposes RACT for the primary loading rack include bottom loading, and the work practice standards of NSPS XX and MACT Subpart R including minimizing spills and expeditious cleanup, loading to certified cargo tank trucks, and use of VCS and VRU to attain a maximum one-hour average emission rate of 10 mg/l or 0.08 lbs VOC/1000 gallons of gasoline loaded as required by MACT Subpart R.

Chevron proposes RACT for the specialty loading rack be bottom loading for Transmix and slop as well as the work practice standard of minimizing spills and expeditiously cleaning up spills when they do occur. Adding a VCS and VRU to control the minimal emissions from loading at this rack are not considered cost effective as a majority of products loaded from the specialty loading racks are finished lubricants, lubricant additives and base oils, which are very low volatility products and generate a small fraction of the total emissions from the facility.

2.2.2 Storage Tanks

SLMT utilizes twenty five tanks to store gasoline, ethanol (oxygenate), Transmix, diesel fuel, water, additives, hydraulic fluid, motor oil, or jet fuel. See Table 3 for a description of each tank and product stored. A majority of the tanks store low volatility products.

2.2.2.1 Reasonable Control Technologies

When tanks are filled with gasoline, diesel, ethanol, additives, Transmix or slop, VOCs are displaced to the atmosphere. To minimize the vapors released to the atmosphere, the vapors can be controlled by one or more of the following methods as described below:

1) Employ submerged or bottom loading of tanks
2) Utilizing a fixed roof (commonly used for smaller tanks or containing low vapor pressure materials)
3) Utilize internal floating roof tanks with rim seals for gasoline tanks (or liquids with true vapor pressure of 1.5 psia or greater)
4) Vapor recovery unit (VRU) with carbon adsorption
5) Thermal oxidation system with an open or enclosed flame (aka vapor combustion unit [VCU])

A review of the RBLC found the following:

- BACT for two separate facilities with gasoline tanks was deemed internal floating roof design with dual rim seals.
- BACT for a chemical plant with 3 fixed roof tanks employed a water scrubber, however that plant produces methanol and it was assumed these were not gasoline or diesel containing tanks and were disregarded.
- LAER for a large crude terminal adding 3 million barrels of DEFR storage utilized VCU as a control. The tanks added at this terminal are substantially larger capacity than those at SLMT and the controls were considered for a more stringent control level and was therefore not considered comparable and was disregarded.

2.2.2.2 Eliminate Technically Infeasible Control Technologies

The first three design control technologies are technically feasible for the SLMT. It is questionable whether fluctuations in vapor loading from the tanks would be sufficient for a VRU to operate efficiently. However, this technology will be further considered.

2.2.2.3 Rank Remaining Control Technologies Based on Capture and Control Efficiencies

VCU or VRU controls would provide the highest level of control. VCU's for this type of operation would be expected to result in the highest control of VOCs. If vapor loading was sufficient to operate a VRU efficiently, a VRU could result in similar emission controls as the VCU. Internal floating roof controls are the next most efficient control option and are almost as efficient by themselves as a VCU or VRU on a fixed roof tank.

Internal floating roof tanks are already used on all the tanks with relatively high vapor pressures (e.g. gasoline and Transmix.). Use of a VCU or VRU in addition to an internal floating roof, would theoretically provide the highest level of control, but is rarely used due to the high extra cost for VCU and VRU relative to the modest emissions from the internal floating roof. Use of top-submerged or bottom loading with a fixed roof is the next most effective and is the most common control for liquids with very low vapor pressures or relatively small tanks which have low emission generation within the tank.

2.2.2.4 Evaluate Remaining Control Technologies on Economic, Energy, and Environmental Feasibility

As discussed in Section 2.2.1.4, VRUs result in cost savings associated with the recycled, recovered and reused gasoline and other hydrocarbon vapor, rather than the loss and destruction of the gasoline and vapor by combustion. Combustion and partial combustion of organic pollutants also creates secondary pollutants including nitrogen oxides, carbon monoxide, sulfur oxides, carbon dioxide and smoke/particulates. However, for the tank application, due to variability in vapor loading, the VCU may be a better control option to evaluate for product tanks.

The current storage control methods are consistent with the most common industry practices and are as or more stringent than the applicable NSPS and MACT standards. All higher vapor pressure liquids including gasoline, ethanol and Transmix are stored in tanks equipped with internal floating roofs and double rim seals. Diesel and all but a few additive products are stored in fixed roof tanks. The remaining products used in smaller quantities are stored in horizontal tanks. All products with a vapor pressure greater than 1.1 psia are stored in floating roof tanks.

Only the four gasoline tanks at the terminal have potential emissions greater than 1 tpy of VOC emissions. Per UDAQ R307-415-5e.(2)(b) the remaining tanks are considered insignificant activities because the individual tank emissions are less than 1 tpy.

As highlighted in section 2.2.1.4, the Control Techniques Guidelines for the Oil and Natural Gas Industry assumed in 2012 dollars indicated the costs of installation and operation of a new VRU including retrofit of a storage vessel. The cost of such controls is fairly high, and not cost effective for a system with a relatively low emissions rate. Cost of retrofitting controls on individual tanks is clearly not cost effective. A system would be a little more cost effective if SLMT were to retrofit all or most of the 25 tanks to a single new VRU system. However, even if retrofitted to all the tanks, it would only control approximately 5-6 tpy of VOC emissions. The costs for a larger VRU system, the retrofit to multiple tanks, and the ductwork to collect their emissions is expected to be deemed not cost effective.

2.2.2.5 Select RACT

Chevron proposes RACT for the gasoline and Transmix tanks to be employ top-submerged or bottom loading of tanks, utilize internal floating roof tanks with rim seals and utilize good operating practices and compliance with NSPS Kb.

Proposed RACT for remaining product storage tanks is employing top-submerged or bottom loading of the tanks, good design and operating practices utilizing a fixed roof or horizontal tank.

2.2.3 Fugitive Emissions

Fugitive emissions occur from leaks arising from piping (connectors and flanges), valves, pumps and compressors at the facility.

2.2.3.1 Reasonable Control Technologies

The following practices can reduce VOC emissions from leaking piping, valves, pumps and compressors at the facility:

1) Work practice standards including:
    a. Routine leak inspections of all equipment in gasoline service utilizing sight, sound and smell. Document inspections and repair any leaks within 5 days of detecting the leak, **OR** Routine leak inspection program using organic detection instrumentation such as a PID or FID instead of using only "sight, sound and smell"
    b. Minimize spills and clean up any spills expeditiously
    c. Cover all open gasoline containers with a gasketed seal when not in use
    d. Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.

A review of the RBLC found the following:

- BACT for a chemical plant included 28 VHP LDAR monitoring per Texas fugitive guidance. 28VHP is required for synthetic organic chemical manufacturing industry and is not considered comparable and was disregarded.
- LAER for a large crude terminal adding 3 million barrels of DEFR storage utilized the 28LAER LDAR monitoring per Texas fugitive guidance for severe nonattainment areas. This facility is considerably larger than SLMT and is located in a severe nonattainment area and was considered for a more stringent control level and was therefore not considered comparable and was disregarded.

2.2.3.2 Eliminate Technically Infeasible Control Technologies

The work practices are technically feasible for the SLMT. However, an inspection program using organic detection instrumentation such as a PID or FID instead of using only "sight, sound and smell" is used for larger and more complex fugitive sources such as large chemical plants and petroleum refineries. Such an inspection program is not practical for the relatively modest number of sources and small emissions at this terminal. Total fugitive emissions at this facility are estimated to be less than 1 ton/year total. These low emissions are due to the relatively limited number of fugitive emission points and also the relatively moderate operating conditions (e.g. temperatures and pressures) of a terminal compared to the more severe operating conditions of a chemical plant or refinery. These differences are observed in the EPA Protocol for Equipment Leak Emissions Estimates[5] which provides average uncontrolled emissions factors for various types of facilities. The table below shows that typical fugitive leaks from terminals are orders of magnitude lower than from more severe operations of a refinery or chemical plant. Because of this difference, and the significant overhead costs of maintaining an instrument monitoring program, such programs are not typically considered for the small fugitive emissions of terminals. Additionally, for low pressure liquid systems such as at a terminal, an inspection program based on sight, sound and smell is very effective.

Facility Type	Light Liquid Valves	Light Liquid Pump Seal
Marketing Terminal	0.000043 kg/hr/source	0.00054 kg/hr/source
Petroleum Refinery	0.0109 kg/hr/source	0.114 kg/hr/source
SOCMI Chemical Plant	0.00403 kg/hr/source	0.0199 kg/hr/source

2.2.3.3 Rank Remaining Control Technologies Based on Capture and Control Efficiencies

Not Applicable

2.2.3.4 Evaluate Remaining Control Technologies on Economic, Energy, and Environmental Feasibility

There are no adverse environmental, economic, or energy impacts with these work practice standards.

[5] https://www3.epa.gov/ttnchie1/efdocs/equiplks.pdf

2.2.3.5 Select RACT

Chevron proposes RACT for the fugitive equipment leaks to include the monitoring and work practice standards found in MACT subpart R, NSPS XX and Kb and as outlined in Section 2.2.3.1

Appendix A - 2016 Emission Inventory

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
12-MONTH ROLLING AIR EMISSIONS
January 2016 - December 2016
2016 Annual Throughputs and Emissions Summary

Total Facility Throughputs

Organic Liquid	Permit Limits*	Actual 12-Month Total	Unit	% of Limit
Gasoline	11,905,000	5,876,595	bbl	49%
Oxygenate	928,000	658,992	bbl	71%
Additives	10,688	1,808	bbl	17%
Distillate	11,905,000	3,707,501	bbl	31%

*Approval Order DAQE-AN105560017-15, May 18, 2015; rolling 12-month total.

Total Facility Emissions

Pollutant	Permit Limits*	Actual 12-Month Total	Unit	% of Limit
VOCs	33.6	14.98	ton	45%
HAPs	4.19	0.74	ton	18%
Xylene	2533	221	lb	9%
Toluene	2345	355	lb	15%

*Approval Order DAQE-AN105560017-15, May 18, 2015; rolling 12-month total.

2016 Annual Emissions
Emissions Summary, Rolling 12-Month Total

Pollutants		Truck Rack	Tanks	Fugitive	Total
		Emissions, ton			
VOCs		8.62	5.61	0.75	14.98
HAPs		0.20	0.44	0.11	0.74
	CAS	Emissions, lb			
	00095-63-6	2.40	38.45	23.88	64.73
2,2,4-Trimethylpentane (isooctane)	00540-84-1	114.10	113.11	39.02	266.24
Benzene	00071-43-2	49.31	181.06	16.76	247.13
	00110-82-7	17.95	12.35	3.16	33.46
Ethylbenzene	00100-41-4	6.15	41.02	12.68	59.85
Hexane (-n)	00110-54-3	111.47	177.41	18.08	306.96
Isopropyl benzene	00098-82-8	1.09	12.93	4.82	18.84
Naphthalene	00091-20-3	0.05	4.30	4.05	8.40
Toluene	00108-88-3	85.41	211.51	58.39	355.31
Xylenes (mixed isomers)	01330-20-7	25.29	135.75	59.72	220.77

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
12-MONTH ROLLING AIR EMISSIONS
January 2016 - December 2016

TRUCK RACK EMISSIONS

Truck Rack VOC Emissions

VRU Data														
Description		**2016 Jan**	**2016 Feb**	**2016 Mar**	**2016 Apr**	**2016 May**	**2016 Jun**	**2016 Jul**	**2016 Aug**	**2016 Sep**	**2016 Oct**	**2016 Nov**	**2016 Dec**	**TOTAL**
Primary VRU														
Fraction of time Primary VRU is used (%)		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
		9/17/2015	9/17/2015	9/17/2015	9/17/2015	9/17/2015	9/17/2015	9/17/2015	9/17/2015	9/17/2015	9/17/2015	11/10/2016	11/10/2016	
VRU Efficiency		99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.90%	99.90%	
Secondary VRU														
Fraction of time Secondary VRU is used (%)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
		9/15/2015	9/15/2015	9/15/2015	9/15/2015	9/15/2015	9/15/2015	9/15/2015	9/15/2015	9/15/2015	9/15/2015	11/8/2016	11/8/2016	
VRU Efficiency		99.86%	99.86%	99.86%	99.86%	99.86%	99.86%	99.86%	99.86%	99.86%	99.86%	99.03%	99.03%	
Weighted Average														
VRU Efficiency		99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.30%	99.90%	99.90%	
Effective Control Efficiency														
		99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	99.20%	
		98.50%	**98.50%**	**98.50%**	**98.50%**	**98.50%**	**98.50%**	**98.50%**	**98.50%**	**98.50%**	**98.50%**	**99.10%**	**99.10%**	
Truck Rack Throughputs (gal)														
Gasoline		19,396,474	18,952,166	20,435,197	19,912,374	19,282,727	20,655,771	22,114,680	22,015,516	20,799,493	23,119,416	19,515,286	20,617,909	**246,817,008**
Jet A		1,868,286	1,920,660	2,167,914	1,628,046	1,845,522	2,094,666	2,520,966	2,359,812	1,977,822	1,749,678	1,776,138	2,094,162	**24,003,672**
Diesel		11,951,423	12,116,563	9,731,549	10,956,010	8,624,584	9,734,561	9,760,002	11,100,012	10,778,711	15,597,951	10,956,755	10,403,267	**131,711,388**
Ethanol		2,161,404	2,115,372	2,292,486	2,227,890	2,158,842	2,371,404	2,477,706	2,464,518	2,324,952	2,583,084	2,202,144	2,297,862	**27,677,664**
Additive - Techron		5,692	5,743	6,035	5,747	5,695	6,426	6,664	6,689	6,186	6,078	5,797	6,933	**73,685**
Additive - EXXON		0	0	0	0	0	0	0	0	0	0	0	0	**0**
Additive - Generic		143	87	158	214	174	151	186	160	179	437	171	193	**2,253**
Transmix		12,438	11,019	22,115	21,687	21,598	21,136	11,557	21,760	10,551	21,012	21,198	10,648	**206,719**
Slop		0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Throughput (gal)		**35,395,861**	**35,121,610**	**34,655,454**	**34,751,967**	**31,939,142**	**34,884,116**	**36,891,761**	**37,968,467**	**35,897,893**	**43,077,656**	**34,477,489**	**35,430,974**	**430,492,390**
Gasoline	4.87	0.7070	0.6908	0.7448	0.7258	0.7028	0.7529	0.8061	0.8024	0.7581	0.8427	0.4264	0.4505	**8.4102**
Jet A	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0002	0.0001	0.0001	**0.0022**
Diesel	0.01	0.0009	0.0009	0.0007	0.0008	0.0006	0.0007	0.0007	0.0008	0.0008	0.0012	0.0005	0.0005	**0.0093**
Ethanol	0.35	0.0057	0.0056	0.0060	0.0058	0.0057	0.0062	0.0065	0.0065	0.0061	0.0068	0.0035	0.0036	**0.0679**
Additive - Techron	0.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
Additive - EXXON	0.11	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Additive - Generic	0.11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
(no VRU)	1.31	0.0081	0.0072	0.0144	0.0142	0.0141	0.0138	0.0075	0.0142	0.0069	0.0137	0.0138	0.0070	**0.1350**
(no VRU)	1.31	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Total VOC Emissions (ton)		**0.72**	**0.70**	**0.77**	**0.75**	**0.72**	**0.77**	**0.82**	**0.82**	**0.77**	**0.86**	**0.44**	**0.46**	**8.62**

Truck Rack HAP Emissions

Description		2,2,4-Trimethylpentane (isooctane)	Benzene		Ethylbenzene	Hexane (-n)	Isopropyl benzene	Naphthalene	Toluene	Xylenes (mixed isomers)	Total HAP Emissions (lb)
	00095-63-6	00540-84-1	00071-43-2	00110-82-7	00100-41-4	00110-54-3	00098-82-8	00091-20-3	00108-88-3	01330-20-7	
Gasoline	1.19E-04	6.28E-03	2.45E-03	1.05E-03	3.07E-04	6.03E-03	5.06E-05	1.93E-06	4.60E-03	1.32E-03	
Jet A			7.03E-03		1.99E-02	1.45E-02			6.47E-02	4.03E-02	
Diesel	9.17E-03	1.36E-02	1.89E-01		2.88E-02	1.34E-01	9.40E-03	1.08E-03	1.27E-01	6.77E-02	
Ethanol											
Additive-Techron	3.99E-01									1.30E-01	
Additive-EXXON	1.19E-01						4.66E-02	2.35E-04		8.89E-02	
Additive-Generic	1.19E-01						4.66E-02	2.35E-04		8.89E-02	
Transmix	7.92E-04	3.05E-02	1.72E-02	1.24E-03	1.35E-03	2.78E-02	2.46E-04	6.84E-06	1.97E-02	6.25E-03	
Slop	7.92E-04	3.05E-02	1.72E-02	1.24E-03	1.35E-03	2.78E-02	2.46E-04	6.84E-06	1.97E-02	6.25E-03	
January	0.20	9.40	4.08	1.50	0.52	9.22	0.09	0.005	7.08	2.10	32.50
February	0.19	9.14	3.97	1.46	0.50	8.98	0.09	0.005	6.90	2.05	31.64
March	0.21	10.25	4.42	1.60	0.55	9.99	0.10	0.005	7.64	2.26	35.21
April	0.21	10.00	4.35	1.56	0.54	9.77	0.10	0.005	7.47	2.21	34.44
May	0.20	9.70	4.17	1.51	0.51	9.44	0.09	0.004	7.22	2.13	33.27
June	0.22	10.32	4.44	1.61	0.55	10.05	0.10	0.005	7.69	2.27	35.42
July	0.22	10.60	4.48	1.71	0.57	10.34	0.10	0.005	7.94	2.34	36.38
August	0.23	10.97	4.73	1.72	0.59	10.70	0.10	0.005	8.19	2.42	37.71
September	0.21	9.96	4.25	1.60	0.54	9.75	0.10	0.005	7.48	2.21	34.30
October	0.25	11.45	5.04	1.80	0.63	11.24	0.11	0.006	8.62	2.57	39.67
November	0.13	6.21	2.75	0.93	0.33	6.05	0.06	0.003	4.61	1.37	21.39
December	0.13	6.09	2.62	0.96	0.33	5.95	0.06	0.003	4.56	1.35	20.96
Total Emissions (lb)	2.40	114.10	49.31	17.95	6.15	111.47	1.09	0.05	85.41	25.29	**392.88**
										Total HAP Emissions (ton)	**0.20**

Truck Rack HAP Emissions Summary

Pollutant	CAS	Emission (lb)
	00095-63-6	2.40
2,2,4-Trimethylpentane (isooctane)	00540-84-1	114.10
Benzene	00071-43-2	49.31
	00110-82-7	17.95
Ethylbenzene	00100-41-4	6.15
Hexane (-n)	00110-54-3	111.47
Isopropyl benzene	00098-82-8	1.09
Naphthalene	00091-20-3	0.05
Toluene	00108-88-3	85.41
Xylenes (mixed isomers)	01330-20-7	25.29

Notes for Rack Emissions:

2) Vapor capture efficiency = 99.2%. Trucks are required to pass 1-inch water column decay test (MACT Standard). AP-42, Section 5.2 (6/2008).

3) Effective Control Efficiency = (Capture Efficiency) * (Weighted Average VRU Efficiency)

4) With controls: VOC Emissions, ton = (Throughput, gal)/1000 x (EF, lb/1000 gal) x (1 - Effective Control Efficiency) / (2000 lb/ton).
Without controls: VOC Emissions, ton = (Throughput, gal)/1000 x (EF, lb/1000 gal) / (2000 lb/ton).

6) Loading of transmix and slop is not connected to vapor recovery system.

8) HAP Emissions, lb = (VOC Emissions, ton) x (Vapor Weight Fraction) x (2000 lb/ton).

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
12-MONTH ROLLING AIR EMISSIONS
January 2016 - December 2016

TANK EMISSIONS

Tank VOC Emissions (12-Month Total)

Tank	Description	Tank Type	Tank Diameter (ft)	Shell Height (ft)	Normal Flow Level (ft)	Tank Working Volume (gal)	Total 12-month Throughput (gal)	Tank Turnovers	r Pressure Data	VOC Emissions (lb)
Tank 15	Transmix	IFR	15.043	35.51	26	33,706	206,719	6.13	Jet naphtha (JP-4)	328.75
Tank 19	Additive-Generic	VFIX	12.035	15	12	12,708	2,253	0.18	HiTEC Generic	8.33
Tank 26	Additive-Techron	VFIX	10.743	31.27	28.25	18,910	36,843	1.95	Jet kerosene	4.54
Tank 27	Additive-Techron	VFIX	10.737	31.205	28.25	18,721	36,843	1.97	Jet kerosene	4.52
Tank 28	Premium UL	IFR	20.051	35.535	28.42	64,964	-	-	Gasoline (RVP 13)	1,930.84
Tank 29	Additive-EXXON	HRZ	8	16	7.167	5,713	-	-	HITEC EXXON	9.39
Tank 31	Regular UL	IFR	59.777	40.01	31.83	660,461	124,621,125	188.69	Gasoline (RVP 11)	2,767.41
Tank 32	Regular UL	IFR	47.902	32	22.5	298,703	53,409,054	178.80	Gasoline (RVP 11)	2,323.30
Tank 33	ULSD #2 Dyed RR	IFR	47.825	32.025	23.5	310,878	12,605,628	40.55	Distillate fuel oil no. 2	67.56
Tank 34	Premium UL	IFR	47.932	32	25.67	340,088	68,786,830	202.26	Gasoline (RVP 11)	2,385.09
Tank 35	ULSD #1	VFIX	39.918	24.055	21.58	201,576	2,240,359	11.11	Distillate fuel oil no. 2	47.25
Tank 36	ULSD #2	VFIX	59.866	39.985	36.667	771,449	116,865,402	151.49	Distillate fuel oil no. 2	721.75
Tank 37	Ethanol	IFR	47.945	31.19	23	305,949	13,838,832	45.23	Denatured ethanol	187.15
Tank 38	Ethanol	IFR	47.874	32	24.42	323,518	13,838,832	42.78	Denatured ethanol	210.42
Tank 39	Jet A	VFIX	39.853	24.018	20.5	190,653	24,003,672	125.90	Jet kerosene	222.30
Notes:									**Total VOC Emissions (lb)**	**11,218.60**
Emissions from Tanks 4.0.9d									**Total VOC Emissions (ton)**	**5.61**

Tank HAP Emissions (12-Month Total)

HAP Emissions (lb)	1,2,4-Trimethylbenzene	2,2,4-Trimethylpentane (isooctane)	Benzene	Cyclohexane	Ethylbenzene	Hexane (-n)	Isopropyl benzene	Naphthalene	Toluene	Xylenes (mixed isomers)
USER ID	00095-63-6	00540-84-1	00071-43-2	00110-82-7	00100-41-4	00110-54-3	00098-82-8	00091-20-3	00108-88-3	01330-20-7
15A Transmix	0.37	10.08	5.63	0.41	0.48	9.09	0.10	0.01	6.60	2.24
19A Additive-Generic	0.99						0.39	0.00		0.74
26A Additive-Techron	1.81									0.59
27A Additive-Techron	1.80									0.59
28A Premium UL	0.20	10.52	4.10	1.75	0.51	10.10	0.08	0.00	7.71	2.21
29A Additive-EXXON	1.12						0.44	0.00		0.83
31A Regular UL	11.12	33.09	9.39	3.96	5.80	19.63	2.04	1.48	35.37	29.34
32A Regular UL	6.07	23.03	7.09	3.00	3.37	15.59	1.14	0.80	22.85	16.86
33A ULSD #2 Dyed RR	0.16	0.05	0.65		0.17	0.45	0.09	0.14	0.52	0.44
34A Premium UL	7.74	25.84	7.64	3.23	4.16	16.42	1.43	1.03	26.62	20.91
35A ULSD #1	0.43	0.64	8.91		1.36	6.32	0.44	0.05	5.99	3.20
36A ULSD #2	6.62	9.85	136.09		20.75	96.58	6.79	0.78	91.49	48.86
37A Ethanol										
38A Ethanol										
39A Jet A			1.56		4.41	3.23			14.38	8.95
Grand Total	**38.45**	**113.11**	**181.06**	**12.35**	**41.02**	**177.41**	**12.93**	**4.30**	**211.51**	**135.75**

Notes:

Emissions from Tanks 4.0.9d

Total HAP Emissions (lb)	**877.11**
Total HAP Emissions (ton)	**0.44**

Tank HAP Emissions Summary

Pollutant	CAS	Emission (lb)
	00095-63-	38.45
2,2,4-Trimethylpentane (isoo	00540-84-	113.11
Benzene	00071-43-	181.06
	00110-82-	12.35
Ethylbenzene	00100-41-	41.02
Hexane (-n)	00110-54-	177.41
Isopropyl benzene	00098-82-	12.93
Naphthalene	00091-20-	4.30
Toluene	00108-88-	211.51
Xylenes (mixed isomers)	01330-20-	135.75

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
12-MONTH ROLLING AIR EMISSIONS
January 2016 - December 2016

PIPE COMPONENT FUGITIVE EMISSIONS

Fugitive VOC Emissions, lb

Pt Source ID	Source	Service	Number Of Sources	Emission Factors	lb/hr/source	Emissions	ton VOCs
1	Pump Seals	Light Liquid	29	5.4E-04	1.19E-03	301.80	0.15
2	Valves	Gas	73	1.3E-05	2.86E-05	18.29	0.01
3	Valves	Light Liquid	1,024	4.3E-05	9.46E-05	848.58	0.42
4		Light Liquid	1,307	8.0E-06	1.76E-05	201.51	0.10
6		Gas	152	4.2E-05	9.24E-05	123.03	0.06
NA	Pump Seals	Gas	0	6.5E-05	1.43E-04	-	-
NA		Gas	0	1.2E-04	2.64E-04	-	-
NA		Light Liquid	0	1.3E-04	2.86E-04	-	-
Time Basis					**Total Annual VOC Emissions**	**1,493.21**	**0.75**
365	days				**Total Monthly VOC Emissions**	**124.43**	**0.06**
24	hours/day						
8760	hr						

Notes:

EPA-453/R-95-017, November 1995.
2) Emissions, lb = (# of Sources)(Emission Factor, lb/hr/source)(Time, hr)
3) Fittings include connectors and flanges.
4) Others include compressors and equipment other than fittings, pumps, or valves.

Fugitive HAP Emissions, lb

Description	CAS Number	Liquid Weight Fraction	Vapor Weight Fraction	Annual Emissions (lb/yr)	Monthly Emissions (lb/month)
VOC Emissions from liquid service				1,351.89	
VOC Emissions from gas service				141.32	
Total VOC Emissions				1,493.21	
	00095-63-6	1.73E-02	3.15E-03	23.88	1.99
2,2,4-Trimethylpentane (isooctane)	00540-84-1	2.80E-02	8.33E-03	39.02	3.25
Benzene	00071-43-2	5.75E-03	6.36E-02	16.76	1.40
	00110-82-7	2.27E-03	6.42E-04	3.16	0.26
Ethylbenzene	00100-41-4	8.26E-03	1.08E-02	12.68	1.06
Hexane (-n)	00110-54-3	8.32E-03	4.83E-02	18.08	1.51
Isopropyl benzene	00098-82-8	3.24E-03	3.11E-03	4.82	0.40
Naphthalene	00091-20-3	2.96E-03	3.56E-04	4.05	0.34
Toluene	00108-88-3	3.82E-02	4.81E-02	58.39	4.87
Xylenes (mixed isomers)	01330-20-7	4.15E-02	2.54E-02	59.72	4.98
			Total HAPs (lb)	**213.52**	**17.79**
			Total HAPs (ton)	**0.11**	

Notes:

HAP emissions, lb =

(VOC Emissions from Liquid Service, lb) x (Liquid Weight Fraction) +

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
TRUCK RACK EMISSION FACTOR

Rack VOC Loading Losses (Emission Factor)

Description	M	P	S	T	Loading Loss (LL) (lb/1000 gal)	Source for M, P, and T (annual average conditions)
AvGas	69	2.5825	0.6	511.65	2.60	TANKS, gasoline RVP 6
Gasoline (RVP 11)	65	5.1270	0.6	511.65	4.87	TANKS, gasoline RVP 11
Jet A	130	0.0070	0.6	511.65	0.01	TANKS, jet kerosene
Diesel	130	0.0053	0.6	511.65	0.01	TANKS, distillate fuel no. 2
Ethanol	46	0.5207	0.6	511.65	0.35	TANKS, ethanol
Additive-Techron	130	0.0070	0.6	511.65	0.01	TANKS, M and P for jet kerosene
Additive-EXXON	130	0.0600	0.6	511.65	0.11	TANKS, M for jet kerosene, P=0.06 psia from HiTEC 6590 MSDS
Additive-Generic	130	0.0600	0.6	511.65	0.11	TANKS, M for jet kerosene, P=0.06 psia from HiTEC 6590 MSDS
Transmix	80	1.1177	0.6	511.65	1.31	TANKS, jet naphtha
Slop	80	1.1177	0.6	511.65	1.31	TANKS, jet naphtha

Notes

Loading losses calculated as per AP-42, Section 5.2 (6/2008).
LL = [{12.46(M)(P)(S)}/T]
Loading Losses (ton) = [(LL)(TP)]/2000
- LL = Loading loss (lb/1000 gal)
- M = Molecular weight of vapors
- P = True vapor pressure of liquid loaded (psia)
- S = Saturation factor
- T = Temperature (°R)
- TP = Throughput (gallons X1000)

1) M, P, and T as per fuel type based on annual average conditions; from TANKS 4.0.
2) T from TANKS 4.0; 51.98°F bulk liquid temperature = 511.65°R.
3) S=0.6 for submerged loading with dedicated normal service.
4) Loading of transmix and wastewater is not equipped with vapor recovery.

Conversion Factor
1 lb = 453.59 g
1 gal = 3.7854 L

VRU Stack Test Data

Loading Losses for Gasoline (Uncontrolled)

4.87 lb/1000 ga (see calculations in table above)
583.48 mg/L

Primary VRU		Emission mg/L	Emission lb/1000 gal	Efficiency	Secondary VRU	Emission mg/L	Emission lb/1000 gal	Efficiency
Design		10	0.0835	98.29%		30	0.2504	94.86%
Limit		10	0.0835	98.29%		10	0.0835	98.29%
Stack Test Data								
	8/8/1997	8.9	0.0743	98.47%	10/23/1997	4.1	0.0342	99.30%
	11/6/2000	0.83	0.0069	99.86%	11/6/2000	1.01	0.0084	99.83%
	12/8/2004	2.48	0.0207	99.57%	11/8/2005	7.32	0.0611	98.75%
	2009 - Cannot find record				10/7/2009	4.04	0.0337	99.31%
	6/3/2010	0.15	0.0013	99.97%	6/2/2010	0.293	0.0024	99.95%
	8/22/2014	0.59	0.0049	99.90%	8/21/2014	4.08	0.0340	99.30%
	9/17/2015	4.1	0.0342	99.30%	9/15/2015	0.8	0.0067	99.86%
	11/10/2016	0.573	0.0048	99.90%	11/8/2016	5.681	0.0474	99.03%

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
CHEVRON TERMINAL LIQUID AND VAPOR COMPOSITION DATA

Liquid Weight Fraction
Chevron Data, Inputs for TANKS 4.0

Description	1,2,4-Trimethylbenzene (not HAP, need for TRI) 00095-63-6	2,2,4-Trimethylpentane (isooctane) 00540-84-1	Benzene 00071-43-2	Cyclohexane (not HAP, need for TRI) 00110-82-7	Ethylbenzene 00100-41-4	Hexane (-n) 00110-54-3	Cumene Isopropyl benzene 00098-82-8	Naphthalene 00091-20-3	Toluene 00108-88-3	Xylenes (mixed isomers) 01330-20-7		Throughput at Truck Rack (Jan 2016 - Dec 2016) gal
Gasoline	2.71E-02	4.56E-02	9.00E-03	3.70E-03	1.27E-02	1.34E-02	4.80E-03	3.70E-03	6.12E-02	6.56E-02		246,817,008
Jet A			4.00E-05		1.27E-03	5.00E-05			1.33E-03	3.10E-03		24,003,672
Diesel	2.10E-03	1.00E-04	7.00E-04		1.20E-03	3.00E-04	9.00E-04	2.10E-03	1.70E-03	3.40E-03		131,711,388
Additive-Techron	1.40E-01									1.00E-02	MSDS OGA 72040 1/5/2012	73,685
Additive-EXXON	3.00E-01						4.90E-02	5.00E-02		4.90E-02	MSDS HiTEC 6591N 8/1/2014	-
Additive-Generic	3.00E-01						4.90E-02	5.00E-03		4.90E-02	MSDS HiTEC 6590 6/16/2014	2,253
Transmix	3.70E-02	4.56E-02	1.30E-02	9.00E-04	1.15E-02	1.27E-02	4.80E-03	2.70E-03	5.40E-02	6.40E-02		206,719
Slop	3.70E-02	4.56E-02	1.30E-02	9.00E-04	1.15E-02	1.27E-02	4.80E-03	2.70E-03	5.40E-02	6.40E-02		-
Weighted Avg	1.73E-02	2.80E-02	5.75E-03	2.27E-03	8.26E-03	8.32E-03	3.24E-03	2.96E-03	3.82E-02	4.15E-02		

Vapor Weight Fraction
Chevron Data, Calculated by TANKS 4.0 from Chevron Liquid Weight Fraction Data and Salt Lake City Meteorology Data

Description	1,2,4-Trimethylbenzene (not HAP, need for TRI) 00095-63-6	2,2,4-Trimethylpentane (isooctane) 00540-84-1	Benzene 00071-43-2	Cyclohexane (not HAP, need for TRI) 00110-82-7	Ethylbenzene 00100-41-4	Hexane (-n) 00110-54-3	Isopropyl benzene 00098-82-8	Naphthalene 00091-20-3	Toluene 00108-88-3	Xylenes (mixed isomers) 01330-20-7	Source of Composition Data (Tank ID)	Throughput at Truck Rack (Jan 2016 - Dec 2016) gal
Gasoline	1.19E-04	6.28E-03	2.45E-03	1.05E-03	3.07E-04	6.03E-03	5.06E-05	1.93E-06	4.60E-03	1.32E-03	31A Regular UL, 2016 AEI	246,817,008
Jet A			7.03E-03		1.99E-02	1.45E-02			6.47E-02	4.03E-02	39A Jet A, 2016 AEI	24,003,672
Diesel	9.17E-03	1.36E-02	1.89E-01		2.88E-02	1.34E-01	9.40E-03	1.08E-03	1.27E-01	6.77E-02	36A ULSD #2, 2016 AEI	131,711,388
Additive-Techron	3.99E-01									1.30E-01	26A Techron, 2016 AEI	73,685
Additive-EXXON	1.19E-01						4.66E-02	2.35E-04		8.89E-02	29A HiTEC 6591N, 2016 AEI	-
Additive-Generic	1.19E-01						4.66E-02	2.35E-04		8.89E-02	19A HiTEC 6590, 2016 AEI	2,253
Transmix	7.92E-04	3.05E-02	1.72E-02	1.24E-03	1.35E-03	2.78E-02	2.46E-04	6.84E-06	1.97E-02	6.25E-03	15A Transmix, 2016 AEI	206,719
Slop	7.92E-04	3.05E-02	1.72E-02	1.24E-03	1.35E-03	2.78E-02	2.46E-04	6.84E-06	1.97E-02	6.25E-03	15A Transmix, 2016 AEI	-
Weighted Avg	3.15E-03	8.33E-03	6.36E-02	6.42E-04	1.08E-02	4.83E-02	3.11E-03	3.56E-04	4.81E-02	2.54E-02		

CHEVRON PRODUCTS CO.
SALT LAKE CITY MARKETING TERMINAL
TANK SPECIFICATIONS

Tank	Descriptior	Tank Type	Tank Diameter (ft)	Shell Height (ft)	Normal Flow Level (ft)	Tank Working Volume (gal)	Reference
Tank 15	Transmix	IFR	15.043	35.51	26	33,706	Strapping Chart, Tank 15 Tank Calibration Certificate, Issued 10/12/2011.
Tank 19	Additive-G	VFIX	12.035	15	12	12,708	Strapping Chart, Tank 19 Tank Calibration Certificate, Issued 1/24/2008.
Tank 26	Additive-T	VFIX	10.743	31.27	28.25	18,910	Strapping Chart, Tank 26 Tank Calibration Certificate, Issued 11/30/2010.
Tank 27	Additive-T	VFIX	10.737	31.205	28.25	18,721	Strapping Chart, Tank 27 Tank Calibration Certificate, Issued 9/1/2011.
Tank 28	Premium U	IFR	20.051	35.535	28.42	64,964	Strapping Chart, Tank 28 Tank Calibration Certificate, Issued 5/24/2011.
Tank 29	Additive-E	HRZ	8	16	7.167	5,713	Gauge Chart
Tank 31	Regular UL	IFR	59.777	40.01	31.83	660,461	Strapping Chart, Tank 31 Tank Calibration Certificate, Issued 10/12/2011.
Tank 32	Regular UL	IFR	47.902	32	22.5	298,703	Strapping Chart, Tank 32 Tank Calibration Certificate, Issued 10/13/2011.
Tank 33	ULSD #2 D	IFR	47.825	32.025	23.5	310,878	Strapping Chart, Tank 33 Tank Calibration Certificate, Issued 1/9/2007.
Tank 34	Premium U	IFR	47.932	32	25.67	340,088	Strapping Chart, Tank 34 Tank Calibration Certificate, Issued 10/13/2011.
Tank 35	ULSD #1	VFIX	39.918	24.055	21.58	201,576	Strapping Chart, Tank 35 Tank Calibration Certificate, Issued 9/13/2005.
Tank 36	ULSD #2	VFIX	59.866	39.985	36.667	771,449	Strapping Chart, Tank 36 Tank Calibration Certificate, Issued 11/14/2006.
Tank 37	Ethanol	IFR	47.945	31.19	23	305,949	Strapping Chart, Tank 37 Tank Calibration Certificate, Issued 10/13/2011.
Tank 38	Ethanol	IFR	47.874	32	24.42	323,518	Strapping Chart, Tank 38 Tank Calibration Certificate, Issued 8/31/2004.
Tank 39	Jet A	VFIX	39.853	24.018	20.5	190,653	Strapping Chart, Tank 39 Tank Calibration Certificate, Issued 8/22/2007.

HRZ = horizontal
IFR = internal floating roof
VFIX = vertical fixed roof

Appendix B – RACT/BACT/LAER Clearinghouse Search Results

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	SIC_CODE	NAICS_CODE	PERMIT_ISSUANCE_DATE	PERMIT_TYPE	FACILITY_DESCRIPTION	PROCESS_NAME	PROCCESS_TYPE	PRIMARY_FUEL	THROUGH-PUT	THROUGH-PUT_UNIT	PROCESS_NOTES
CA-1226	SFPP,LP	SFPP,LP	SAN DIEGO	CA	APCD2007-APP-985776	5171	424710	06/21/2011 ACT	B		FUEL CARGO TANK UNLOADING STATION	42.002	GASOLINE	330	GPM TRANSFER PUMP	
CA-1228	SFPP,LP		SAN DIEGO	CA	APCD2014-APP-003321	5171	424710	03/17/2014 ACT	C		internal floating roof	42.002	gasoline	475000	gallons	secondary seal, rim mounted rubber wipper with dual wiper tip
IN-0231	COUNTRYMARK REFINING & LOGISTICS, LLC	COUNTRYMARK REFINING & LOGISTICS, LLC	GREENE	IN	055-35558-00003	5171	424710	06/30/2015 ACT	C	BULK STORAGE AND WHOLESALE PETROLEUM PRODUCTS	TRUCK LOADING RACK	42.002		46200	GAL/H	
IN-0243	MARATHON PETROLEUM COMPANY LP	MARATHON PETROLEUM COMPANY LP	POSEY	IN	129-34987-00005	5171	424710	08/14/2015 ACT	B	STATIONARY PETROLEUM STORAGE AND DISTRIBUTION TERMINAL. SOURCE HAS NEW NAME	LOADING RACK	42.002	GASOLINE	741.2	MMGAL	

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	SIC_CODE	NAICS_CODE	PERMIT_ISSUANCE_DATE	PERMIT_TYPE	FACILITY_DESCRIPTION	PROCESS_NAME	PROCCESS_TYPE	PRIMARY_FUEL	THROUGH-PUT	THROUGH-PUT_UNIT	PROCESS_NOTES
IN-0244	COUNTRYMARK REFINING AND LOGISTICS, LLC	COUNTRYMARK REFINING AND LOGISTICS, LLC	MIAMI	IN	103-35351-00011	5171	424710	12/03/2015 ACT	B	STATIONARY BULK PETROLEUM STORAGE AND WHOLESALE FACILITY.	LOADING RACK	42.002	GASOLINE	404.71	MMGAL	
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	4613	486910	03/11/2014 ACT	B	Petroleum pipeline breakout station	26 Internal floating roof storage tanks for materials with RVP <= 15	42.006	Material with RVP <= 15	2072718	MGAL/YR	The throughput of 2,072,718.0 MGAL/YR is for 26 tanks. The tanks have welded steel internal floating roofs with a double seal configuration that comply with the requirements of New Jersey Enhanced VOC RACT rules (N.J.A.C. 7:27-16). The welded steel roofs are designed to eliminate deck seam losses and VOC emissions from roof landing and cleaning operations are vented to a vapor combustion unit (95% VOC control).
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	4613	486910	03/11/2014 ACT	B	Petroleum pipeline breakout station	Light Products Loading Rack	42.002	Gasoline	441.5	MMgal/yr	The loading rack complies with 40 CFR 63 Subpart R, uses vacuum assist to eliminate fugitive emissions, and uses a vapor recovery unit to reduce outlet VOC emissions to <= 1 mg/L
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	4613	486910	03/11/2014 ACT	B	Petroleum pipeline breakout station	Transmix Processing Unit with gas-fired process heaters	19.6	Natural Gas	171.8	MMscf/yr	The unit vents VOC emissions to a vapor combustion unit (95% control efficiency), controls VOC emissions during cleaning operations, and meets New Jersey State of the Art Manual requirements for boilers and process heaters with heat input >= 10 MMBTU/hr but <= 50 MMBTU/hr
TX-0656	GAS TO GASO	NATGASOLINE	JEFFERSON	TX	PSDTX1340	2911	325199	05/16/2014	A	Chemical Plant	heaters (5)	13.31	natural gas	24.3	MMBTU/H	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	2911	325199	05/16/2014 ACT	A	Chemical Plant	Fixed Roof Tanks (3)	42.005		800000	GAL/YR	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	2911	325199	05/16/2014 ACT	A	Chemical Plant	RAILCAR AND TRUCK LOADING	42.004		300000000	GAL/YR	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	2911	325199	05/16/2014 ACT	A	Chemical Plant	GASOLINE STORAGE	42.002		0		3 TANKS: 462000 GAL, 231000 GAL, 231000 GAL
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	2911	325199	05/16/2014 ACT	A	Chemical Plant	METHANOL AND WATER STORAGE TANK	42.009		3087	GAL	2 TANKS
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	2911	325199	05/16/2014 ACT	A	Chemical Plant	Fugitive Components	64.002		0		
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	390 Mbbl Storage Tanks- Routine Operations	42.002		23.4	MMbbl/year	Seven new DEFR storage tanks that each has a 390,000 bbl capacity will be assigned to ‘‘Tank Group 3. The authorized storage products are crude (up to and including RVP 7), condensate (up to and including RVP 11), and gasoline (up to and including RVP 11).
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	210 Mbbl Storage Tank- Routine Operations	42.002		7.62	MMgal/yr	

Appendix B - RACT/BACT/LAER Clearinghouse (RBLC) Results
Chevron Producs Co. - Salt Lake CIty Marketing Terminal

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	SIC_CODE	NAICS_CODE	PERMIT_ISSUANCE_DATE	PERMIT_TYPE	FACILITY_DESCRIPTION	PROCESS_NAME	PROCCESS_TYPE	PRIMARY_FUEL	THROUGH-PUT	THROUGH-PUT_UNIT	PROCESS_NOTES
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	127 Mbbl Storage Tank- Routine Operations	42.002		7.62	MMgal/year	One new DEFR storage tank with a 127,000 bbl capacity will be assigned to Tank Group 3. The authorized storage products are crude (up to and including RVP 7), condensate (up to and including RVP 11), and gasoline (up to and including RVP 11).
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	Storage tanks â€“ MSS operations	42.002		0		Controlled MSS emissions include controlled standing idle, filling, and degassing losses. These controlled MSS emissions are routed to a portable vapor combustor (EPN PORTVC), which releases VOC, nitrogen oxides (NOx) and carbon monoxide (CO) to the atmosphere. Uncontrolled MSS emissions are the result of uncontrolled venting (FIN 390-132, EPN 390-132 MSS; FIN 390-133, EPN 390-133 MSS; FIN 390-134, EPN 390-134 MSS; FIN 390-136, EPN 390-136 MSS; FIN 390-137, EPN 390-137 MSS; FIN 390-138, EPN 390-138 MSS; FIN 390-139, EPN 390-139 MSS; FIN 210-135, EPN 210-135 MSS; and FIN 127-131, EPN 127-131 MSS) of residual waste vapors in the tanks.
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	Fugitive Sources	42.002		0		The equipment components in this amendment will be monitored with the 28LAER LDAR system as required by LAER.
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	Vapor Combustors	42.002		0		Oil tanking will adhere to the BACT requirements of a vapor combustor DRE of at least 99.5% (EPN PORTVC). Also, these portable vapor combustors have a constant pilot flame and the temperature is monitored. Stack tests have already been conducted.
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	Vapor Combustors	42.002		0		Oil tanking will adhere to the BACT requirements of a vapor combustor DRE of at least 99.5% (EPN PORTVC). Also, these portable vapor combustors have a constant pilot flame and the temperature is monitored. Stack tests have already been conducted.
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	Vapor Combustors	42.002		0		Oil tanking will adhere to the BACT requirements of a vapor combustor DRE of at least 99.5% (EPN PORTVC). Also, these portable vapor combustors have a constant pilot flame and the temperature is monitored. Stack tests have already been conducted.
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	2911	493190	06/30/2014 ACT	D	For Hire Terminal	Vapor Combustors	42.002		0		Oil tanking will adhere to the BACT requirements of a vapor combustor DRE of at least 99.5% (EPN PORTVC). Also, these portable vapor combustors have a constant pilot flame and the temperature is monitored. Stack tests have already been conducted.

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	POLLUTANT	TESTMETHOD	CONTROL_METHOD_CODE	CONTROL_METHOD_DESCRIPTION	EMISSION_LIMIT_1	EMISSION_LIMIT_1_UNIT	EMISSION_LIMIT_1_AVG_TIME_CONDITION	CASE-BY-CASE_BASIS	OTHER_APPLICABLE_REQUIREMENTS	OTHER_FACTORS	PERCENT_EFFICIENCY	COMPLIANCE_VERIFIED	EMISSION_LIMIT_2	EMISSION_LIMIT_2_UNIT	Cost_Verified
CA-1226	SFPP,LP	SFPP,LP	SAN DIEGO	CA	APCD2007-APP-985776	Volatile Organic Compounds (VOC)	Unspecified	P	DIRECT PUMP TO IFR TANK THROUGH DEAERATOR	7.24	LB/D		OTHER CASE-BY-CASE	OTHER	U	0	U	0		N
CA-1228	SFPP,LP		SAN DIEGO	CA	APCD2014-APP-003321	Volatile Organic Compounds (VOC)	Unspecified	P	dual rim seals	1718.5	LB/YR		BACT-PSD		U	0	U	0		N
IN-0231	COUNTRYMARK REFINING & LOGISTICS, LLC	COUNTRYMARK REFINING & LOGISTICS, LLC	GREENE	IN	055-35558-00003	Volatile Organic Compounds (VOC)	Unspecified	B	test method - 1	35	MG/LITER		OTHER CASE-BY-CASE		U	0	U	0		N
IN-0243	MARATHON PETROLEUM COMPANY LP	MARATHON PETROLEUM COMPANY LP	POSEY	IN	129-34987-00005	Volatile Organic Compounds (VOC)	Unspecified	A	VAPOR RECOVERY UNIT (CARBON ADSORPTION)	0.159	LB/GAL		OTHER CASE-BY-CASE		U	0	U	741.195	MMGAL/YR	N

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	POLLUTANT	TESTMETHOD	CONTROL_METHOD_CODE	CONTROL_METHOD_DESCRIPTION	EMISSION_LIMIT_1	EMISSION_LIMIT_1_UNIT	EMISSION_LIMIT_1_AVG_TIME_CONDITION	CASE-BY-CASE_BASIS	OTHER_APPLICABLE_REQUIREMENTS	OTHER_FACTORS	PERCENT_EFFICIENCY	COMPLIANCE_VERIFIED	EMISSION_LIMIT_2	EMISSION_LIMIT_2_UNIT	Cost_Verified
IN-0244	COUNTRYMARK REFINING AND LOGISTICS, LLC	COUNTRYMARK REFINING AND LOGISTICS, LLC	MIAMI	IN	103-35351-00011	Volatile Organic Compounds (VOC)	Unspecified	A	RELIEF STACK, A VAPOR KNOCKOUT BOX, AND A FLARE VAPOR CONTROL UNIT	35	MG/L		OTHER CASE-BY-CASE	NSPS , NESHAP	N	0	U	404.712	MMGAL/YR	N
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	Volatile Organic Compounds (VOC)	Unspecified	A	Vapor combustion unit for cleaning & roof landings	0			LAER	NSPS , OPERATING PERMIT , OTHER	U	95	U	0		N
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	Volatile Organic Compounds (VOC)	Unspecified	A	Vapor Recovery Unit	0.42	LB/H		LAER	MACT , OPERATING PERMIT , NSPS , OTHER	U	95	U	0		N
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	Volatile Organic Compounds (VOC)	Unspecified	A	Vapor Combustion Unit	0.11	LB/H		LAER	NSPS , OPERATING PERMIT , OTHER	U	95	U	0.005	LB/MMBTU	N
TX-0656	GAS TO GASO	NATGASOLINE	JEFFERSON	TX	PSDTX1340	Nitrogen Oxides (	Unspecified	P	ultra low NOx burners	0.036	LB/MMBTU		BACT-PSD		U	0	U	0		N
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	Volatile Organic Compounds (VOC)	Unspecified	A	WATER SCRUBBER	1.65	T/YR		BACT-PSD		U	99	U	0		N
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	Volatile Organic Compounds (VOC)	Unspecified	A	WATER SCRUBBER	1.38	T/YR		BACT-PSD		N	99	U	0		N
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	Volatile Organic Compounds (VOC)	Unspecified	A	INTERNAL FLOATING ROOF	3.19	T/YR		BACT-PSD		N	0	U	2.73	T/YR	N
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	Volatile Organic Compounds (VOC)	Unspecified	P	HORIZONTAL FIXED ROOF WITH SUBMERGED FILL, WHITE EXTERIOR	0.12	T/YR		BACT-PSD		N	0	U	0		N
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	Volatile Organic Compounds (VOC)	EPA/OAR Mthd 21	P	LDAR 28 VHP	500	PPM		BACT-PSD		N	0	U	0		N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Volatile Organic Compounds (VOC)	Unspecified	P	Domed External Floating Roof	7.56	LB	HOUR	LAER	NSPS , MACT	U	0	U	2.19	TON	N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Volatile Organic Compounds (VOC)	Unspecified	P	Domed External Floating Roof	10.29	POUND	HOUR	LAER	NSPS , MACT	U	0	U	1.71	TON	N

Appendix B - RACT/BACT/LAER Clearinghouse (RBLC) Results
Chevron Producs Co. - Salt Lake CIty Marketing Terminal

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	POLLUTANT	TESTMETHOD	CONTROL_METHOD_CODE	CONTROL_METHOD_DESCRIPTION	EMISSION_LIMIT_1	EMISSION_LIMIT_1_UNIT	EMISSION_LIMIT_1_AVG_TIME_CONDITION	CASE-BY-CASE_BASIS	OTHER_APPLICABLE_REQUIREMENTS	OTHER_FACTORS	PERCENT_EFFICIENCY	COMPLIANCE_VERIFIED	EMISSION_LIMIT_2	EMISSION_LIMIT_2_UNIT	Cost_Verified
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Volatile Organic Compounds (VOC)	Unspecified	P	Domed External Floating Roof	13.17	POUND	HOUR	LAER	NSPS , MACT	U	0	U	1.43	TON	N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Volatile Organic Compounds (VOC)	Unspecified	B	Vapor Combustor	0			LAER		U	0	U	0		N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Volatile Organic Compounds (VOC)	Unspecified	P	LDAR	0.03	POUND	HOUR	LAER	MACT	U	0	U	0.13	TON	N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Volatile Organic Compounds (VOC)	Unspecified	P	99.5% DRE	156.16	POUND	HOUR	LAER	MACT	U	99.5	U	0		N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Carbon Dioxide	Unspecified	P	GOOD COMBUSTION PRACTICES	46.32	POUND	HOUR	LAER	MACT	U	0	U	53.53	TON	N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Nitrogen Oxides (NOx)	Unspecified	P	GOOD COMBUSTION PRACTICES	3.6	POUND	HOUR	LAER	MACT	U	0	U	4.78	TON	N
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	Benzene	Unspecified	P	99.5% DRE	1.64	POUND	HOUR	BACT-PSD	MACT	U	99.5	U	0		N

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	POLLUTANT_COMPLIANCE_NOTES
CA-1226	SFPP,LP	SFPP,LP	SAN DIEGO	CA	APCD2007-APP-985776	
CA-1228	SFPP,LP		SAN DIEGO	CA	APCD2014-APP-003321	
IN-0231	COUNTRYMARK REFINING & LOGISTICS, LLC	COUNTRYMARK REFINING & LOGISTICS, LLC	GREENE	IN	055-35558-00003	(1)THE VOC EMISSIONS FROM THE TRUCK LOADING RACK WHEN LOADING DIESEL FUEL SHALL NOT EXCEED 0.014 LB/KGAL. (2)THE VOC EMISSIONS FROM THE TRUCK LOADING RACK WHEN LOADING KEROSENE SHALL NOT EXCEED 0.016 POUND PER KILOGALLON (LB/KGAL). (3)THE PERMITTEE SHALL COMPLY WITH THE FOLLOWING LEAK PREVENTION MEASURES AND LOADING PRACTICES: □I)THE PERMITEE SHALL LOAD ONLY GASOLINE, DISTILLATE (DIESEL AND KEROSENE) FUELS INTO CARGO TANKS AT THE TRUCK LOADING RACK USING SUBMERGED FILLING. □II)MEASURES MUST BE TAKEN TO MINIMIZE GASOLINE OR DISTILLATE FUEL SPILLS. □III)SPILLS SHALL BE CLEANED UP AS EXPEDITIOUSLY AS PRACTICABLE. □IV)MINIMIZE FUEL SENT TO OPEN WASTE COLLECTION SYSTEMS THAT COLLECT AND TRANSPORT FUEL TO RECLAMATION AND RECYCLING DEVICES, SUCH AS OIL/WATER SEPARATORS. □6)THE OWNER/OPERATOR OF THIS BULK GASOLINE TERMINAL SHALL NOT PERMIT THE LOADING OF GASOLINE INTO ANY TRANSPORT UNLESS: (I)TO ENSURE THAT LEAKLESS TANK TRUCKS ARE USED, PROPER OPERATING PROCEDURES AND PERIODIC MAINTENANCE OF HATCHES, P-V VALVES AND LIQUID AND GASEOUS CONNECTIONS MUST BE PERFORMED. THE OWNER OR OPERATOR SHALL OBTAIN THE VAPOR TIGHTNESS DOCUMENTATION DESCRIBED IN Â§60.505(B) FOR EACH GASOLINE TANK TRUCK WHICH IS TO BE LOADED AT THE LOADING RACK. (II) THE OWNER OR OPERATOR SHALL REQUIRE THE TANK IDENTIFICATION NUMBER TO BE RECORDED AS EACH GASOLINE TANK TRUCK IS LOADED AT THE AFFECTED FACILITY. (1) THE OWNER OR OPERATOR SHALL CROSS-CHECK EACH TANK IDENTIFICATION NUMBER OBTAINED IN PARAGRAPH (E)(2) OF THIS SECTION WITH THE FILE OF TANK VAPOR TIGHTNESS DOCUMENTATION WITHIN 2 WEEKS AFTER THE CORRESPONDING TANK IS LOADED, UNLESS EITHER OF THE FOLLOWING CONDITIONS IS MAINTAINED: (A) IF LESS THAN AN AVERAGE OF ONE GASOLINE TANK TRUCK PER MONTH OVER THE LAST 26 WEEKS IS LOADED WITHOUT VAPOR TIGHTNESS DOCUMENTATION THEN THE DOCUMENTATION CROSS-CHECK SHALL BE PERFORMED EACH QUARTER; OR (B) IF LESS THAN AN AVERAGE OF ONE GASOLINE TANK TRUCK.
IN-0243	MARATHON PETROLEUM COMPANY LP	MARATHON PETROLEUM COMPANY LP	POSEY	IN	129-34987-00005	STATE BACT (A) THE VAPOR RECOVERY UNIT (VRU) ASSOCIATED W/TRUCK LOADING RACK & BARGE LOADING RACK SHALL OPERATE AT ALL TIMES THAT THESE LOADING RACKS ARE IN OPERATION & LOADING GASOLINE AND/OR ETHANOL. (B) THE VOC EMISSIONS FROM THE VAPOR RECOVERY UNIT (VRU) ASSOCIATED W/TRUCK LOADING RACK & BARGE LOADING RACK WHEN LOADING GASOLINE AND/OR ETHANOL SHALL NOT EXCEED 19.05MG/L (0.159LB/KGAL). (C) THE VOC EMISSIONS FROM THE TRUCK LOADING RACK WHEN LOADING DIESEL FUEL SHALL NOT EXCEED 0.014 LB PER KILOGALLON (LB/KGAL). (D) THE VOC EMISSIONS FROM THE BARGE LOADING RACK WHEN LOADING DIESEL FUEL SHALL NOT EXCEED 0.012 LB/KGAL. (E) THE PERMITTEE SHALL COMPLY WITH THE FOLLOWING LEAK PREVENTION MEASURES & LOADING PRACTICES: (1) THE PERMITEE SHALL LOAD ONLY GASOLINE AND OR ETHANOL & DIESEL FUELS INTO CARGO TANKS AT THE TRUCK & BARGE LOADING RACKS USING SUBMERGED FILLING. (2) MEASURES MUST BE TAKEN TO MINIMIZE GASOLINE AND/OR ETHANOL & DIESEL FUEL SPILLS. (3) SPILLS SHALL BE CLEANED UP AS EXPEDITIOUSLY AS PRACTICABLE. (4) MINIMIZE FUEL SENT TO OPEN WASTE COLLECTION SYSTEMS THAT COLLECT & TRANSPORT FUEL TO RECLAMATION & RECYCLING DEVICES, SUCH AS OIL/WATER SEPARATORS. (5)□HE OWNER/OPERATOR OF THIS BULK GASOLINE TERMINAL SHALL NOT PERMIT THE LOADING OF GASOLINE AND/OR ETHANOL INTO ANY TRANSPORT UNLESS: (A)□O ENSURE THAT LEAKLESS TANK TRUCKS ARE USED, PROPER OPERATING PROCEDURES AND PERIODIC MAINTENANCE OF HATCHES, P-V VALVES AND LIQUID AND GASEOUS CONNECTIONS MUST BE PERFORMED. THE OWNER OR OPERATOR SHALL OBTAIN THE VAPOR TIGHTNESS DOCUMENTATION DESCRIBED IN Â§60.505(B) FOR EACH GASOLINE TANK TRUCK WHICH IS TO BE LOADED AT THE TRUCK AND BARGE LOADING RACKS. (B) □HE OWNER OR OPERATOR SHALL REQUIRE THE TANK IDENTIFICATION NUMBER TO BE RECORDED AS EACH GASOLINE TANK TRUCK IS LOADED AT THE AFFECTED FACILITY. (1) □HE OWNER OR OPERATOR SHALL CROSS-CHECK EACH TANK IDENTIFICATION NUMBER OBTAINED IN PARAGRAPH(E)(2) OF THIS SECTION WI

Appendix B - RACT/BACT/LAER Clearinghouse (RBLC) Results
Chevron Producs Co. - Salt Lake CIty Marketing Terminal

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	POLLUTANT_COMPLIANCE_NOTES
IN-0244	COUNTRYMARK REFINING AND LOGISTICS, LLC	COUNTRYMARK REFINING AND LOGISTICS, LLC	MIAMI	IN	103-35351-00011	STATE BACT (A)THE VAPOR COMBUSTION UNIT SHALL BE IN OPERATION AT ALL TIMES THE TRUCK LOADING RACK IS LOADING GASOLINE AND/OR ETHANOL. (C)THE VOC EMISSIONS FROM THE TRUCK LOADING RACK WHEN LOADING DIESEL FUEL SHALL NOT EXCEED 0.014 LB/KGAL. (D)THE VOC EMISSIONS FROM THE TRUCK LOADING RACK WHEN LOADING KEROSENE SHALL NOT EXCEED 0.016 POUND PER KILOGALLON (LB/KGAL). (E)THE PERMITTEE SHALL COMPLY WITH THE FOLLOWING LEAK PREVENTION MEASURES AND LOADING PRACTICES: (1)THE PERMITEE SHALL LOAD ONLY GASOLINE, DISTILLATE (DIESEL AND KEROSENE) FUELS INTO CARGO TANKS AT THE TRUCK LOADING RACK USING SUBMERGED FILLING. (2)MEASURES MUST BE TAKEN TO MINIMIZE GASOLINE OR DISTILLATE FUEL SPILLS. (3)SPILLS SHALL BE CLEANED UP AS EXPEDITIOUSLY AS PRACTICABLE. (4) MINIMIZE FUEL SENT TO OPEN WASTE COLLECTION SYSTEMS THAT COLLECT AND TRANSPORT FUEL TO RECLAMATION AND RECYCLING DEVICES, SUCH AS OIL/WATER SEPARATORS. (5)THE OWNER/OPERATOR OF THIS BULK GASOLINE TERMINAL SHALL NOT PERMIT THE LOADING OF GASOLINE INTO ANY TRANSPORT UNLESS: (A)TO ENSURE THAT LEAKLESS TANK TRUCKS ARE USED, PROPER OPERATING PROCEDURES AND PERIODIC MAINTENANCE OF HATCHES, P-V VALVES AND LIQUID AND GASEOUS CONNECTIONS MUST BE PERFORMED. THE OWNER OR OPERATOR SHALL OBTAIN THE VAPOR TIGHTNESS DOCUMENTATION DESCRIBED IN Â§60.505(B) FOR EACH GASOLINE TANK TRUCK WHICH IS TO BE LOADED AT THE LOADING RACK. (B) THE OWNER OR OPERATOR SHALL REQUIRE THE TANK IDENTIFICATION NUMBER TO BE RECORDED AS EACH GASOLINE TANK TRUCK IS LOADED AT THE AFFECTED FACILITY. (1) THE OWNER OR OPERATOR SHALL CROSS-CHECK EACH TANK IDENTIFICATION NUMBER OBTAINED IN PARAGRAPH (E)(2) OF THIS SECTION WITH THE FILE OF TANK VAPOR TIGHTNESS DOCUMENTATION WITHIN 2 WEEKS AFTER THE CORRESPONDING TANK IS LOADED, UNLESS EITHER OF THE FOLLOWING CONDITION CONDITIONS IS MAINTAINED: (I) IF LESS THAN AN AVERAGE OF ONE GASOLINE TANK TRUCK PER MONTH OVER THE LAST 26 WEEKS IS LOADED WITHOUT VAPOR TIGHTNESS DOCUMENTATION THEN THE DOCU
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	Other Applicable Requirements: The tanks are also subject to NSPS Subpart Kb and GACT Subpart BBBBBB. The twenty six internal floating roof tanks for materials with RVP <= 15 are of different sizes as follows: Seven storage tanks with a capacity of 2,268,000 gallons per tank, throughput 331,128 Mgal/yr; Thirteen storage tanks with a capacity of 5,040,000 gallons per tank, throughput 735,840 Mgal/yr; Two storage tanks with a capacity of 630,000 gallons per tank, throughput 229,250 Mgal/yr; Two storage tanks with a capacity of 2,100,000 gallons per tank, throughput 776,500 Mgal/yr.
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	Other Applicable Requirements: Also subject to GACT BBBBBB
NJ-0083	COLONIAL PIPELINE CO LINDEN JCT TANK FARM	COLONIAL PIPELINE	MIDDLESEX	NJ	18046 / BOP130002	Other Applicable Requirements: subject to New Jersey State Of The Art (SOTA) Manual for Boilers and Process heaters
TX-0656	GAS TO GASO	NATGASOLINE	JEFFERSON	TX	PSDTX1340	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	
TX-0656	GAS TO GASOLINE PLANT	NATGASOLINE	JEFFERSON	TX	PSDTX1340 AND 107764	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	

Appendix B - RACT/BACT/LAER Clearinghouse (RBLC) Results
Chevron Producs Co. - Salt Lake CIty Marketing Terminal

RBLCID	FACILITY_NAME	CORPORATE_OR_COMPANY_NAME	FACILITY_COUNTY	FACILITY_STATE	PERMIT_NUM	POLLUTANT_COMPLIANCE_NOTES
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	
TX-0661	OILTANKING APPELT TERMINAL	OILTANKING HOUSTON, L.P.	HARRIS	TX	95968, N188	

Appendix C – CTG for the Oil and Natural Gas – Section 4: Storage Vessels

(applicable sections pages 4-1 through 4-16)

4.0 STORAGE VESSELS

Storage vessels are significant sources of VOC emissions in the oil and natural gas industry. This chapter provides a description of the types of storage vessels present in the oil and natural gas industry, and provides VOC emission estimates for storage vessels, in terms of mass of emissions per throughput, for both crude oil and condensate storage vessels. This chapter also presents control techniques used to reduce VOC emissions from storage vessels, along with their costs and potential emission reductions. Finally, this chapter provides a discussion of our recommended RACT for storage vessels.

4.1 Applicability

For purposes of this CTG, the emissions and emission controls discussed herein would apply to a tank or other vessel in the oil and natural gas industry that contains an accumulation of crude oil, condensate, intermediate hydrocarbon liquids, or produced water, and that is constructed primarily of non-earthen materials (such as wood, concrete, steel, fiberglass, or plastic) that provide structural support. The emissions and emission controls discussed herein would not apply to the following vessels:

(1) Vessels that are skid-mounted or permanently attached to something that is mobile (such as trucks, railcars, barges, or ships), and are intended to be located at a site for less than 180 consecutive days.

(2) Process vessels such as surge control vessels, bottoms receivers, or knockout vessels.

(3) Pressure vessels designed to operate in excess of 204.9 kilopascals (29.7 pounds per square inch) and without emissions to the atmosphere.[12]

4.2 Process Description and Emission Sources

4.2.1 Process Description

Storage vessels in the oil and natural gas industry are used to hold a variety of liquids including crude oil, condensates, produced water, etc. While still underground and at reservoir pressure, crude oil contains many lighter hydrocarbons in solution. When the oil is brought to the

[12] It is acknowledged that even pressure vessels designed to operate without emissions have a small potential for fugitive emissions at valves. Valves are threaded components that would be subject to leak detection and repair requirements.

surface, many of the dissolved lighter hydrocarbons (as well as water) are removed through a series of separators. Crude oil is passed through either a two-phase separator (where the associated gas is removed and any oil and water remain together) or a three-phase separator (where the associated gas is removed and the oil and water are also separated). The remaining oil is then directed to a storage vessel where it is stored for a period of time before being transported off-site. Much of the remaining hydrocarbon gases in the oil are released from the oil as vapors in the storage vessels. Storage vessels are typically installed with similar or identical vessels in a group, referred to in the industry as a tank battery.

Emissions of the hydrocarbons from storage vessels are a function of flash, breathing (or standing), and working losses. Flash losses occur when a liquid with entrained gases is transferred from a vessel with higher pressure to a vessel with lower pressure, thus allowing entrained gases or a portion of the liquid to vaporize or flash. In the oil and natural gas industry, flashing losses occur when crude oils or condensates flow into an atmospheric storage vessel from a processing vessel (e.g., a separator) operated at a higher pressure. Typically, the larger the pressure drop, the more flash emissions will occur in the storage vessel. The temperature of the liquid may also influence the amount of flash emissions. Breathing losses are the release of gas associated with temperature fluctuations and other equilibrium effects. Working losses occur when vapors are displaced due to the emptying and filling of storage vessels. The volume of gas vapor emitted from a storage vessel depends on many factors. Lighter crude oils flash more hydrocarbons than heavier crude oils. In storage vessels where the oil is frequently cycled and the overall throughput is high, working losses are higher. Additionally, the operating temperature and pressure of oil in the separator dumping into the storage vessel will affect the volume of flashed gases coming out of the oil.

The composition of the vapors from storage vessels varies, and the largest component is methane, but also may include ethane, butane, propane, and HAP such as benzene, toluene, ethylbenzene and xylenes (commonly referred to as BTEX), and n-hexane.

4.2.2 Emissions Data

4.2.2.1 Summary of Major Studies and Emissions

There are numerous studies and reports available that estimate storage vessel emissions. We consulted several of these studies and reports to evaluate the emissions and emission reduction options for storage vessels. Table 4-1 presents a summary of the references for these reports, along with an indication of the type of information available in each reference.

Table 4-1. Major Studies Reviewed for Consideration of Emissions and Activity Data[a,b]

Report Name	Affiliation	Year of Report	Activity Factors	Emissions Data	Control Options[e]
VOC Emissions from Oil and Condensate Storage Tanks	Texas Environmental Research Consortium	2009	Regional	X	X
Upstream Oil and Gas Storage Tank Project Flash Emissions Models Evaluation – Final Report	Texas Commission on Environmental Quality	2009	Regional	X	
Initial Economic Impact Analysis for Proposed State Implementation Plan Revisions to the Air Quality Control Commission's Regulation Number 7	Colorado Air Quality Control Commission	2008	NA		X
E&P TANKS	API		National	X	
Inventory of U.S. Greenhouse Gas Emissions and Sinks[c]	EPA	Annual	National	X	
Greenhouse Gas Reporting Program (Annual Reporting: Current Data Available for 2011-2013)[d]	EPA	2014	Facility-Level	X	X

NA = Not Applicable.

[a] U.S. Environmental Protection Agency. *Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution - Background Supplemental Technical Support Document for the Final New Source Performance Standards*. April 2012. EPA Docket ID No. EPA-HQ-OAR-2010-0505-4550.

[b] U.S. Environmental Protection Agency. *Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution - Technical Support*. July 2011. EPA-453/R-11-002.

[c] U.S Environmental Protection Agency. *Inventory of U.S. Greenhouse Gas Emissions and Sinks*. Washington, DC. https://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

[d] U.S. Environmental Protection Agency. *Greenhouse Gas Reporting Program*. Washington, DC. November 2014.

[e] An "X" in this column does not necessarily indicate that the EPA has received comprehensive data on control options from any one of these reports. The type of emissions control information that the EPA has received from these reports varies substantially from report to report.

4.2.2.2 Representative Storage Vessel Baseline Emissions

Storage vessels vary in size and throughputs. In support of the 2013 NSPS Reconsideration,[13] average storage vessel emissions, in terms of mass of emissions per throughput, were developed for both crude oil and condensate storage vessels.[14] We also developed mass emissions per throughput estimates using the American Petroleum Institute's (API's) E&P TANKS program and more than 100 storage vessels across the country with varying characteristics.[15] The VOC emissions per throughput estimates used for this analysis are:

(1) Uncontrolled VOC Emissions from Crude Oil Storage Vessels = 0.214 tpy VOC/barrel per day (bbl/day); and

(2) Uncontrolled VOC Emissions from Condensate Storage Vessels = 2.09 tpy VOC/bbl/day.

On a nationwide basis, there are a wide variety of storage vessel sizes, as well as rates of throughput for each tank. Emissions are directly related to the throughput of liquids for a given storage vessel; therefore, in support of the 2013 NSPS Reconsideration, we adopted production rate brackets developed by the U.S. Energy Information Administration (U.S. EIA) for our emission estimates. To estimate the emissions from an average storage vessel within each production rate bracket, we developed average production rates for each bracket. This average was calculated using the U.S. EIA published nationwide production per well per day for each production rate bracket from 2006 through 2009. Table 4-2 presents the average oil production and condensate production in barrels per well per day. For this analysis, we considered the liquid produced (as reported by the U.S. EIA) from oil wells to be crude oil and from gas wells to be condensate. Table 4-2 presents the average VOC emissions for each storage vessel within each production rate bracket calculated by applying the average production rate (bbl/day) to the VOC emissions per throughput estimates (tpy VOC/bbl/day).

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[13] 78 FR 58416, September 23, 2013. The EPA issued final updates to its 2012 VOC performance standards for storage tanks used in crude oil and natural gas production and transmission. The amendments reflected updated information that responded to issues raised in several petitions for reconsideration of the 2012 standards.

[14] Brown, Heather, EC/R Incorporated. Memorandum prepared for Bruce Moore, EPA/OAQPS/SPPD/FIG. *Revised Analysis to Determine the Number of Storage Vessels Projected to be Subject to New Source Performance Standards for the Oil and Natural Gas Sector*. 2013.

[15] American Petroleum Institute. *Production Tank Emissions Model. E&P Tank Version 2.0. A Program for Estimating Emissions from Hydrocarbon Production Tanks*. Software Number 4697. April 2000.

Table 4-2. Average Oil and Condensate Production and Storage Vessel Emissions per Production Rate Bracket[16]

Production Rate Bracket (BOE/day)[a]	Oil Wells		Gas Wells	
	Average Oil Production Rate per Oil Well (bbl/day)[b]	Crude Oil Storage Vessel VOC Emissions (tpy)[c]	Average Condensate Production Rate per Gas Well (bbl/day)[b]	Condensate Storage Vessel VOC Emissions (tpy)[c]
0-1	0.385	0.083	0.0183	0.038
1-2	1.34	0.287	0.0802	0.168
2-4	2.66	0.570	0.152	0.318
4-6	4.45	0.953	0.274	0.573
6-8	6.22	1.33	0.394	0.825
8-10	8.08	1.73	0.499	1.04
10-12	9.83	2.11	0.655	1.37
12-15	12.1	2.59	0.733	1.53
15-20	15.4	3.31	1.00	2.10
20-25	19.9	4.27	1.59	3.32
25-30	24.3	5.22	1.84	3.85
30-40	30.5	6.54	2.55	5.33
40-50	39.2	8.41	3.63	7.59
50-100	61.6	13.2	5.60	11.7
100-200	120	25.6	12.1	25.4
200-400	238	51.0	23.8	49.8
400-800	456	97.7	44.1	92.3
800-1,600	914	196	67.9	142
1,600-3,200	1,692	363	148	311
3,200-6,400	3,353	719	234	490
6,400-12,800	6,825	1,464	891	1,864
> 12,800[d]	0	0	0	0

Minor discrepancies may be due to rounding.

[a] BOE=Barrels of Oil Equivalent

[b] Oil and condensate production rates published by U.S. EIA. "United States Total Distribution of Wells by Production Rate Bracket."

[c] Oil storage vessel VOC emission factor = 0.214 tpy VOC/bbl/day. Condensate storage vessel VOC emission factor = 2.09 tpy/bbl/day.

[d] There were no new oil and gas well completions in 2009 for this rate category. Therefore, average production rates were set to zero.

[16] Brown, Heather, EC/R Incorporated. Memorandum prepared for Bruce Moore, EPA/OAQPS/SPPD/FIG. *Revised Analysis to Determine the Number of Storage Vessels Projected to be Subject to New Source Performance Standards for the Oil and Natural Gas Sector*. 2013.

4.3 Available Controls and Regulatory Approaches

In analyzing available controls for storage vessels, we reviewed information obtained in support of the 2012 NSPS[17] and the 2013 NSPS Reconsideration actions, control techniques identified in the Natural Gas STAR program, and existing state regulations that require control of VOC emissions from storage vessels in the oil and natural gas industry. Section 4.3.1 presents a non-exhaustive discussion of available VOC emission control methods for storage vessels. Section 4.3.2 includes a summary of the federal, state, and local regulatory approaches that control VOC emissions from crude oil and condensate storage vessels.

4.3.1 Available VOC Emission Control Options

The options generally used as the primary means to limit the amount of VOC vented are to: (1) route emissions from the storage vessel through an enclosed system to a process where emissions are recycled, recovered, or reused in the process – "route to a process" (e.g., by installing a vapor recovery unit (VRU) that recovers vapors from the storage vessel) for reuse in the process or for beneficial use of the gas onsite and/or (2) route emissions from the storage vessel to a combustion device. While EPA explored these options within the document, there may be other emission controls that sources may wish to employ to ensure continuous compliance with EPA's RACT recommendation. Regardless of the type of emission control method that a source may choose to utilize, the recommended RACT level of control explained more fully below is meant to apply at all times. One of the clear advantages the first option has over the second option is that it results in a cost savings associated with the recycled, recovered and reused natural gas and other hydrocarbon vapor, rather than the loss and destruction of the natural gas and vapor by combustion. Combustion and partial combustion of organic pollutants also creates secondary pollutants including nitrogen oxides, carbon monoxide, sulfur oxides, carbon dioxide and smoke/particulates. These emission control methods are described below along with their emission reduction control effectiveness as they apply to storage vessels in the industry and the potential costs associated with their installation and operation.

[17] *Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standard for Hazardous Air Pollutants Reviews. Final Rule.* 77 FR 49490, August 16, 2012.

4.3.1.1 *Routing Emissions to a Process via a Vapor Recovery Unit (VRU)*

Description

One option for controlling storage vessel emissions is to route vapors from the storage vessel back to the inlet line of a separator, to a sales gas line, or to some other line carrying hydrocarbon fluids for beneficial use, such as use as a fuel. Where a compressor is used to boost the recovered vapors into the line, this is often referred to as a VRU.[18] Typically with a VRU, hydrocarbon vapors are drawn out of the storage vessel under low pressure and are piped to a separator, or suction scrubber, to collect any condensed liquids, which are usually recycled back to the storage vessel. Vapors from the separator flow through a compressor that provides the low-pressure suction for the VRU system where the recovered hydrocarbons can be transported to various places, including a sales line and/or for use onsite.

Types of VRUs include conventional VRUs and venturi ejector vapor recovery units (EVRU™) or vapor jet systems.[19] Decisions on the type of VRU to use are based on the applicability needs (e.g., an EVRU™ is recommended where there is a high-pressure gas compressor with excess capacity and a vapor jet VRU is suggested where there is produced water, less than 75 million cubic feet (MMcf)/day gas and discharge pressures below 40 pounds per square inch gauge (psig)). The reliability and integrity of the compressor and suction scrubber and integrity of the lines that connect the tank to the compressor will affect the effectiveness of the VRU system to collect and recycle vapors.[20]

A conventional VRU is equipped with a control pilot to shut down the compressor and permit the back flow of vapors into the tank in order to prevent the creation of a vacuum in the top of a tank when liquid is withdrawn and the liquid level drops. Vapors are then either sent to the pipeline for sale or used as onsite fuel. Figure 4.1 presents a diagram of a conventional VRU installed on a single crude oil storage vessel (multiple tank installations are also common).[21]

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[18] American Petroleum Institute. Letter to Bruce Moore, SPPD/OAQPS/EPA from M. Todd, API. *Re: Oil and Natural Gas Sector Consolidated Rulemaking*. Docket ID No. EPA-HQ-OAR-2010-0505.
[19] U.S. Environmental Protection Agency. Lessons Learned from Natural Gas STAR Partners. *Installing Vapor Recovery Units*. Natural Gas STAR Program. Source Reduction Training to Interstate Oil and Gas Compact Commission Presentation. February 27, 2009.
[20] U.S. Environmental Protection Agency. Lessons Learned from Natural Gas STAR Partners. *Installing Vapor Recovery Units on Storage Tanks*. Natural Gas STAR Program. October 2006.
[21] Ibid.

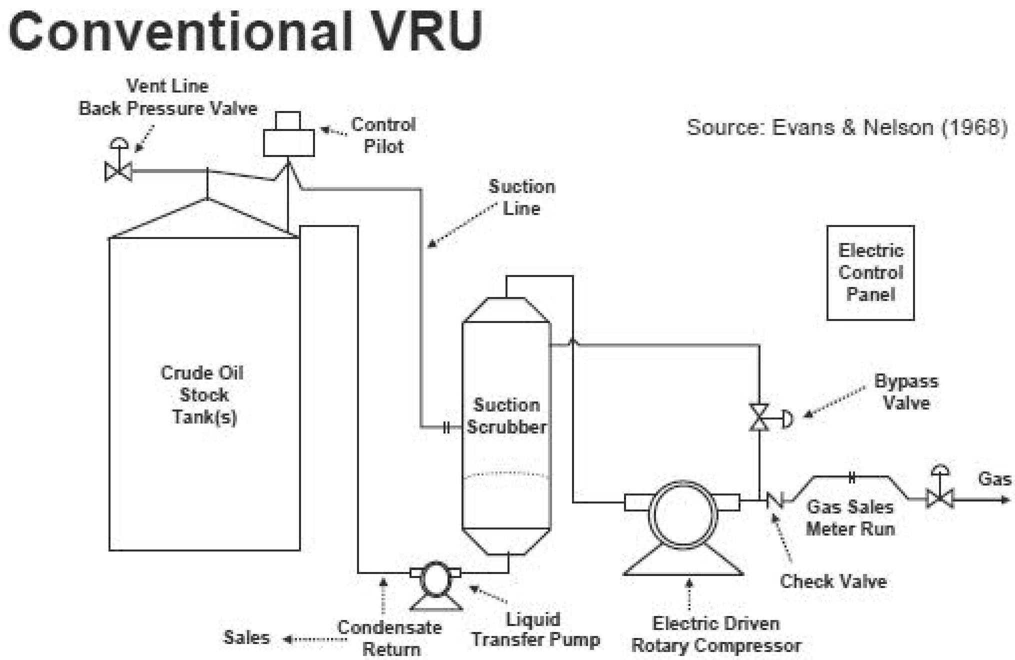

Figure 4-1. Conventional Vapor Recovery System

Control Effectiveness

Vapor recovery units have been shown to reduce VOC emissions from storage vessels by over 95 percent.[22] When operating properly, VRUs generally approach 100 percent efficiency. We recognize that VRUs may not continuously meet this efficiency in practice. Therefore, our analysis assumes a 95 percent reduction in VOC emissions for a VRU. A VRU recovers hydrocarbon vapors that potentially can be used as supplemental burner fuel, or the vapors can be condensed and collected as condensate that can be sold. If natural gas is recovered, it can be sold as well, as long as a gathering line is available to convey the recovered salable gas product to market or to further processing. A VRU cannot be used in all instances. Conditions that affect the feasibility of the use of a VRU include: the availability of electrical service sufficient to power the compressor; fluctuations in vapor loading caused by surges in throughput and flash emissions from the storage vessel; potential for drawing air into condensate storage vessels causing an explosion hazard; and lack of appropriate destination or use for the vapor recovered.

[22] Ibid.

Cost Impacts

Cost data for a VRU obtained from an initial economic impact analysis prepared for proposed state-only revisions to a Colorado regulation are presented here.[23] We assumed cost information contained in the Colorado economic impact analysis to be given in 2012 dollars. According to the Colorado economic impact analysis, the cost of a VRU was estimated to be $90,000. Including costs associated with freight and design, and the cost of VRU installation, we estimated costs to be $102,802 ($90,000 plus $12,802). We also added an estimated storage vessel retrofit cost of $68,736 assuming that the cost of retrofitting an existing storage vessel was 75 percent of the purchased equipment cost (i.e., VRU capital cost and freight and design cost).[24] Based on these costs, we estimated the total capital investment of the VRU to be $171,538. These cost data are presented in Table 4-3. We estimated total annual costs using 2012 dollars to be $28,230 per year without recovered natural gas savings. The uncontrolled emissions from a storage vessel are largely dependent on the bbl/year throughput (see Table 4-2), which greatly influences both the controlled emissions and the cost of control per ton of VOC reduced. Costs may vary due to VRU design capacity, system configuration, and individual site needs and recovery opportunities.

In order to assess the cost of control of a VRU for uncontrolled storage vessels that emit differing emissions, we evaluated the cost of routing VOC emissions from an existing uncontrolled storage vessel to a VRU for a storage vessel that emits 2 tpy, 4 tpy, 6 tpy, 8 tpy, 10 tpy, 12 tpy, and 25 tpy. We estimated the cost of control without savings by dividing the total annual costs without savings by the tpy reduced assuming 95 percent control. The cost of control with savings is calculated by assuming a 95 percent reduction of VOC emissions by the VRU and converting the reduced VOC emissions to natural gas savings. Table 4-4 presents the estimated natural gas savings and the VOC cost per ton of VOC reduced with and without savings.

[23] Initial Economic Impact Analysis for Proposed Revisions to the Colorado Air Quality Control Commission Regulation Number 7, *Emissions of Volatile Organic Compounds*. November 15, 2013.
[24] U.S. Environmental Protection Agency. Lessons Learned from Natural Gas STAR Partners. *Installing Vapor Recovery Units on Storage Tanks.* Natural Gas STAR Program. October 2006.

Table 4-3. Total Capital Investment and Total Annual Costs of a Vapor Recovery Unit System

Cost Item[a]	Cost ($2012)
Capital Cost Items	
VRU[a]	$90,000
Freight and Design[a]	$1,648
VRU Installation[a]	$11,154
Storage Vessel Retrofit[b]	$68,736
Total Capital Investment	$171,538
Annual Cost Items	
Maintenance	$9,396
Capital Recovery (7 percent interest, 15 year equipment life) ($/yr)	$18,834
Total Annual Costs w/o Savings ($/yr)	***$28,230***

[a] Cost data from the Initial Economic Impact Analysis for proposed revisions to Colorado Air Quality Control Commission Regulation Number 7, Submitted with Request for Hearing Documents on November 15, 2013.
[b] Assumes the storage vessel retrofit cost is 75 percent of the purchased equipment price (assumed to include vent system and piping to route emissions to the control device). Retrofit assumption from Exhibit 6 of the EPA Natural Gas Star Lessons Learned, *Installing Vapor Recovery Units on Storage Tanks*. October 2006.

Table 4-4. Cost of Routing Emissions from an Existing Uncontrolled Storage Vessel to a VRU ($/ton of VOC Reduced)

Uncontrolled Storage Vessel Emissions (tpy)	Cost per Ton of VOC Reduced ($2012)		
	Without Savings	Natural Gas Savings (Mscf/yr)[a]	With Savings[b]
2	$14,858	59	$14,734
4	$7,429	118	$7,305
6	$4,953	177	$4,828
8	$3,714	236	$3,590
10	$2,972	295	$2,847
12	$2,476	353	$2,352
25	$1,189	736	$1,065

[a] The natural gas savings was calculated by assuming 95 percent VOC recovery and 31 Mscf/yr natural gas savings per ton of VOC recovered.
[b] Assumes a natural gas price of $4.00 per Mcf.

Additionally, if a VRU is used to control VOC emissions from multiple storage vessels, the VOC emissions cost of control would be reduced because the cost for the additional storage vessel(s) would only include the storage vessel retrofit costs, and the overall VOC emission reductions would increase.

4.3.1.2 Routing Emissions to a Combustion Device

Description and Control Effectiveness

Combustors (e.g., enclosed combustion devices, thermal oxidizers and flares that use a high-temperature oxidation process) are also used to control emissions from storage vessels. Combustors are used to control VOC in many industrial settings, since the combustor can normally handle fluctuations in concentration, flow rate, heating value, and inert species content.[25] For this analysis, we assumed that the types of combustors installed in the oil and natural gas industry can achieve at least a 95 percent control efficiency on a continuing basis.[26] We note that combustion devices can be designed to meet 98 percent control efficiencies, and can control, on average, emissions by 98 percent or more in practice when properly operated.[27] We also recognize that combustion devices that are designed to meet a 98 percent control efficiency may not continuously meet this efficiency in practice, due to factors such as variability of field conditions.

A typical combustor used to control emissions from storage vessels in the oil and natural gas industry is an enclosed combustion system. The basic components of an enclosed combustion system include (1) piping for collecting emission source gases, (2) a single- or multiple-burner unit, (3) a stack enclosure, (4) a pilot flame to ignite the mixture of emission source gas and air and (5) combustor fuel/piping (as necessary). Figure 4-2 presents a schematic of a typical dual-burner enclosed combustion system.

[25] U.S. Environmental Protection Agency. AP 42, Fifth Edition, Volume I, *Chapter 13.5 Industrial Flares*. Office of Air Quality Planning & Standards. 1991.
[26] U.S. Environmental Protection Agency. *Air Pollution Control Technology Fact Sheet: FLARE*. Clean Air Technology Center.
[27] The EPA has currently reviewed performance tests submitted for 19 different makes/models of combustor control devices and confirmed that they meet the performance requirements in NSPS subpart OOOO and NESHAP subparts HH and HHH. All reported control efficiencies were above 99.9 percent at tested conditions. The EPA notes that the control efficiency achieved in the field is likely to be lower than the control efficiency achieved at a bench test site under controlled conditions, but we believe that these units should have no problem meeting 95 percent control continuously and 98 percent control on average when designed and properly operated to meet 98 percent control.

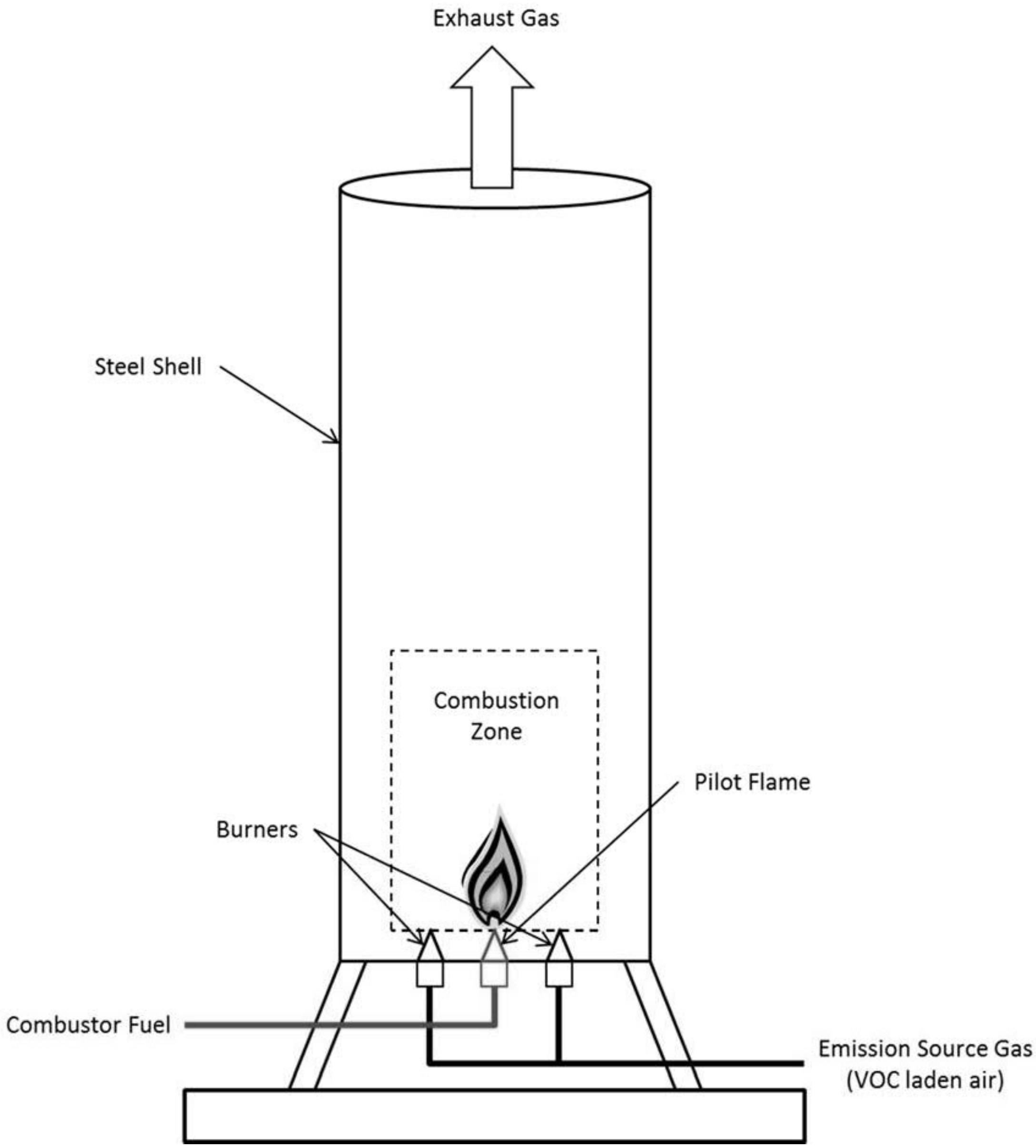

Figure 4-2. Schematic of a Typical Enclosed Combustion System

Thermal oxidizers, also referred to as direct flame incinerators, thermal incinerators, or afterburners, could also be used to control VOC emissions. Similar to a basic enclosed combustion device, a thermal oxidizer uses burner fuel to maintain a high temperature (typically 800-850°C) within a combustion chamber. The VOC laden emission source gas is injected into the combustion chamber where it is oxidized (burned), and then the combustion products are exhausted to the atmosphere. Figure 4-3 provides a basic schematic of a thermal oxidizer.[28]

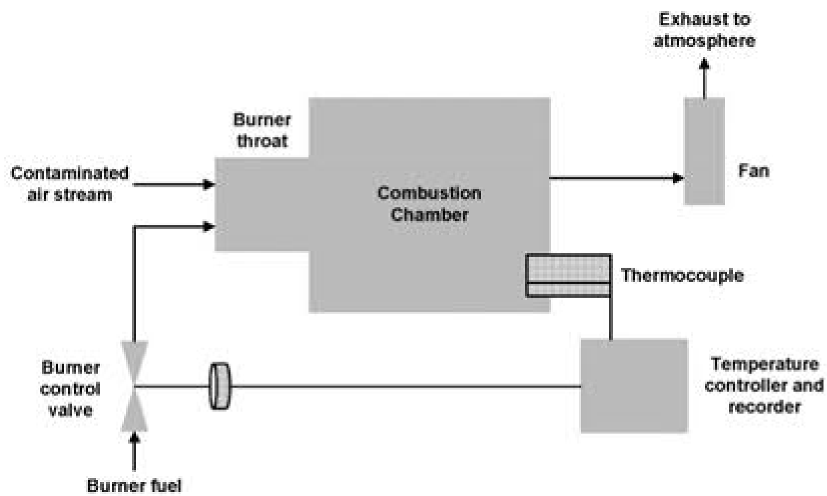

Figure 4-3. Basic Schematic of a Thermal Oxidizer

<u>Cost Impacts</u>

For combustion devices, we obtained cost data from the initial economic impact analysis prepared for state-only revisions to the Colorado regulation.[29] In addition to these cost data, we added line items for operating labor, a surveillance system and data management. This is consistent with the guidelines outlined in the EPA's Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual (OCCM) for combustion devices and the cost analysis prepared for the 2012 NSPS.[30,31] However, OCCM guidelines specify 630 operating labor hours

[28] U.S. Environmental Protection Agency. Technology Transfer Network. Clearinghouse for Inventories and Emission Factors. *Thermal Oxidizer*. Website: https://cfpub.epa.gov/oarweb/mkb/contechnique.cfm?ControlID=17.
[29] Initial Economic Impact Analysis for Proposed Revisions to the Colorado Air Quality Control Commission Regulation Number 7, *Emissions of Volatile Organic Compounds*. November 15, 2013.
[30] *Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standard for Hazardous Air Pollutants Reviews. Final Rule*. 77 FR 49490, August 16, 2012.
[31] U.S. Environmental Protection Agency. *OAQPS Control Cost Manual: Sixth Edition* (EPA 452/B-02-001). Research Triangle Park, NC.

per year for a combustion device, which we believe is unreasonable because many of these sites are unmanned and would most likely be operated remotely. Therefore, we assumed that the operating labor would be more similar to that estimated for a condenser in the OCCM, 130 hours per year. We estimated a total capital investment of $100,986 and total annual costs of $25,194 per year. The total capital investment cost includes a storage vessel retrofit cost of $68,736 (as discussed previously for VRUs) to accommodate the use of a combustion device. These cost data are presented in Table 4-5.

Table 4-5. Total Capital Investment and Total Annual Costs of a Combustor[32]

Cost Item[a]	Cost ($2012)
Capital Cost Items	
Combustor[a]	$18,169
Freight and Design[a]	$1,648
Auto Ignitor[a]	$1,648
Surveillance System[b,c,d]	$3,805
Combustor Installation[a]	$6,980
Storage Vessel Retrofit[e]	$68,736
Total Capital Investment	$100,986
Annual Cost Items	
Operating Labor[f]	$5,155
Maintenance Labor[f]	$4,160
Non-Labor Maintenance[a]	$2,197
Pilot Fuel	$1,537
Data Management[c]	$1,057
Capital Recovery (7 percent interest, 15 year equipment life) ($/yr)	$11,088
Total Annual Cost ($/yr)	$25,194

[a] Cost data from Initial Economic Impact Analysis for proposed revisions to Colorado Air Quality Control Commission Regulation Number 7, Submitted with Request for Hearing Documents on November 15, 2013.
[b] Surveillance system identifies when pilot is not lit and attempts to relight it, documents the duration of time when the pilot is not lit, and notifies and operator that repairs are necessary.

[32] U.S. Environmental Protection Agency. *Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution - Background Supplemental Technical Support Document for the Final New Source Performance Standards*. April 2012. EPA Docket Number EPA-HQ-OAR-2010-0505-4550.

[c] U.S. Environmental Protection Agency. *Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution - Background Supplemental Technical Support Document for the Final New Source Performance Standards*. April 2012. EPA Docket ID No.EPA-HQ-OAR-2010-0505-4550.
[d] Cost obtained from 2012 NSPS TSD and escalated using the change in GDP: Implicit Price Deflator from 2008 to 2012 (percent)(which was 5.69 percent). Source: FRED GDP: Implicit Price Deflator from Jan 2008 to Jan 2012 (http://research.stlouisfed.org/fred2/series/GDPDEF/#).
[e] Retrofit cost obtained from Storage Vessel Retrofit in Table 4-3 (assumed to include vent system and piping to route emissions to the control device).
[f] Operating labor consists of labor resources for technical operation of device (130 hr/yr) and supervisory labor (15 percent of technical labor hours). Maintenance labor hours are assumed to be the same as operating labor (130 hr/yr). Labor rates are $32.00/hr (for technical and maintenance labor) and $51.03 (supervisory labor) and were obtained from the U.S. Department of Labor, Bureau of Labor Statistics, Employer Costs for Employee Compensation, December 2012. Labor rates account for total compensation (wages/salaries, insurance, paid leave, retirement and savings, supplemental pay and legally required benefits).

As noted previously, storage vessels vary in size and throughputs and the uncontrolled emissions from a storage vessel are largely dependent on the bbl/year throughput (see Table 4-2), which greatly influences both the controlled emissions and cost of control. In order to assess the cost of control of combustion for uncontrolled storage vessels that emit differing emissions, we evaluated the costs of routing VOC emissions from an existing storage vessel to a combustion device for an existing uncontrolled storage vessel that emits 2 tpy, 4 tpy, 6 tpy, 8 tpy, 10 tpy, 12 tpy and 25 tpy. We estimated the cost of control without savings by dividing the total annual costs without savings by the tpy reduced assuming 95 percent control. Table 4-6 presents these costs. The VOC emissions cost of control per ton of VOC reduced would be less if a combustion device is used to control uncontrolled VOC emissions from multiple storage vessels because the cost for the additional storage vessel(s) would only include storage vessel retrofit costs, and the overall VOC emission reductions would increase.

Table 4-6. Cost of Routing Emissions from an Existing Uncontrolled Storage Vessel to a Combustion Device ($/ton of VOC Reduced)

Uncontrolled Storage Vessel Emissions (tpy)	Cost per Ton of VOC Reduced ($2012)
2	$13,260
4	$6,630
6	$4,420
8	$3,315